



**US Army Corps
of Engineers**

Construction Engineering
Research Laboratories

USACERL Special Report 99/17
December 1998

Technical Review of the Economic Development Conveyance Application of Fitzsimons Army Medical Center, Aurora, Colorado

by

Jeffrey J. Bogg, Samuel L. Hunter, Jane E. DeRose, Jeffrey G. Kirby, Gary L. Gerdes, Michael K. Brewer,
Thomas E. Durbin, Chris Dilks, Richard L. Schneider, Shawn R. Hill, and Jonathan D. Trucano



In 1993 President Clinton requested that Congress provide new authority to expedite the reuse of military bases adversely affected by Base Realignment and Closure (BRAC) actions. The result was a new property transfer method, called an Economic Development Conveyance (EDC), which gives greater flexibility to the Department of Defense (DoD) and affected communities to negotiate a mutually beneficial property transfer.

On 15 January 1998, the Fitzsimons Re-development Authority filed an EDC application for transfer of Fitzsimons Army Medical Center, a U.S. Army installation slated in 1995 for closure under BRAC. The U.S. Army Construction Engineering Research Laboratories was tasked by Headquarters, U.S. Army Corps of Engineers to (1) review the EDC application for compliance with DoD rules implementing the Federal EDC policy, (2) analyze the findings, and (3) report to the sponsor.

19990120 0908

The contents of this report are not to be used for advertising, publication, or promotional purposes. Citation of trade names does not constitute an official endorsement or approval of the use of such commercial products. The findings of this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

DESTROY THIS REPORT WHEN IT IS NO LONGER NEEDED

DO NOT RETURN IT TO THE ORIGINATOR

USER EVALUATION OF REPORT

REFERENCE: USACERL Special Report 99/17, *Technical Review of the Economic Development Conveyance Application for Fitzsimons Army Medical Center, Aurora, Colorado*

Please take a few minutes to answer the questions below, tear out this sheet, and return it to USACERL. As user of this report, your customer comments will provide USACERL with information essential for improving future reports.

1. Does this report satisfy a need? (Comment on purpose, related project, or other area of interest for which report will be used.)

2. How, specifically, is the report being used? (Information source, design data or procedure, management procedure, source of ideas, etc.)

3. Has the information in this report led to any quantitative savings as far as manhours/contract dollars saved, operating costs avoided, efficiencies achieved, etc.? If so, please elaborate.

4. What is your evaluation of this report in the following areas?

a. Presentation: _____

b. Completeness: _____

c. Easy to Understand: _____

d. Easy to Implement: _____

e. Adequate Reference Material: _____

f. Relates to Area of Interest: _____

g. Did the report meet your expectations? _____

h. Does the report raise unanswered questions? _____

- i. General Comments. (Indicate what you think should be changed to make this report and future reports of this type more responsive to your needs, more usable, improve readability, etc.)
-
-
-
-
-
-

5. If you would like to be contacted by the personnel who prepared this report to raise specific questions or discuss the topic, please fill in the following information.

Name: _____

Telephone Number: _____

Organization Address: _____

6. Please mail the completed form to:

Department of the Army
CONSTRUCTION ENGINEERING RESEARCH LABORATORIES
ATTN: CECER-TR-I
P.O. Box 9005
Champaign, IL 61826-9005

REPORT DOCUMENTATION PAGE

*Form Approved
OMB No. 0704-0188*

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave Blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED	
	December 1998	Final	
4. TITLE AND SUBTITLE Technical Review of the Economic Development Conveyance Application for Fitzsimons Army Medical Center, Aurora, Colorado			5. FUNDING NUMBERS MIPR 8ACERB3003
6. AUTHOR(S) Jeffrey J. Bogg, Samuel L. Hunter, Jane E. DeRose, Jeffrey G. Kirby, Gary L. Gerdes, Michael K. Brewer, Thomas E. Durbin, Chris Dilks, Richard L. Schneider, Shawn R. Hill, and Jonathan D. Trucano			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Construction Engineering Research Laboratories (USACERL) P.O. Box 9005 Champaign, IL 61826-9005			8. PERFORMING ORGANIZATION REPORT NUMBER SR 99/17
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Headquarters, U.S. Army corps of Engineers ATTN: CERE-C 20 Massachusetts Avenue, NW Washington, DC 20314-1000			10. SPONSORING / MONITORING AGENCY REPORT NUMBER
11. SUPPLEMENTARY NOTES Copies are available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.		12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) In 1993 President Clinton requested that Congress provide new authority to expedite the reuse of military bases adversely affected by Base Realignment and Closure (BRAC) actions. The result was a new property transfer method, called an Economic Development Conveyance (EDC), which gives greater flexibility to the Department of Defense (DoD) and affected communities to negotiate a mutually beneficial property transfer. On 15 January 1998, the Fitzsimons Redevelopment Authority filed an EDC application for transfer of Fitzsimons Army Medical Center, a U.S. Army installation slated in 1995 for closure under BRAC. The U.S. Army Construction Engineering Research Laboratories was tasked by Headquarters, U.S. Army Corps of Engineers to (1) review the EDC application for compliance with DoD rules implementing the Federal EDC policy, (2) analyze the findings, and (3) report to the sponsor.			
14. SUBJECT TERMS Base Realignment and Closure (BRAC) Fitzsimons Army Medical Center Economic Development Conveyance (EDC) economic impact Aurora, CO market research			15. NUMBER OF PAGES 250
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT SAR

Executive Summary

Adverse Economic Impact of the Closure on the Region and the Potential for Recovery After the EDC (Chapter 1)

The impact analysis presented in the EDC application suffers from a series of theoretical and practical limitations that most likely overstate the socioeconomic impacts associated with the closure of Fitzsimons Army Medical Center. The first weakness in the application methodology relates to the choice of an overly small region of impact (ROI). In addition, the economic impacts are likely to have been overstated due to an inflated estimate of onsite employment, as well as the lack of consideration given to job replacement efforts in the determined ROI.

Specifically, the Fitzsimons Redevelopment Authority (FRA) estimated that total detrimental impacts are expected to be on the order of 12,316 direct and indirect jobs, accounting for \$328 million in total output. By contrast, USACERL determined that impacts would likely amount to 4,920 direct and indirect jobs, or \$220 million in gross output. In any case, even under the most conservative assumptions, a full economic recovery from the closure of Fitzsimons will be likely, particularly given the relative insignificance of the closure on the regional economy.

Extent of Long-Term Job Creation (Chapter 2)

USACERL's analysis of potential long-term job creation suggests that about 3,370 direct and 6,447 total jobs will eventually be created as a result of the EDC. While the direct estimate presented in the EDC application of 3,731 jobs varies slightly, USACERL's review suggests that this direct estimate was generated in a methodologically sound manner.

Overall, the major discrepancy between the FRA's estimate and USACERL's estimates resulted from the FRA's failure to consider indirect employment effects, which resulted in an understatement of total job creation. Nevertheless, the total number of jobs that will eventually be created as a result of the proposed

EDC will likely mitigate adverse employment impacts generated from the 1995 BRAC decision.

Consistency of the EDC Application With the Overall Redevelopment Plan (Chapter 3)

After reviewing the FRA EDC application and January 1997 Fitzsimons Redevelopment Plan, USACERL finds that the application is generally consistent with the goals, objectives, and implementation strategies set forth in the Redevelopment Plan. Although little attention is given to the specific marketing strategies and techniques outlined in the Redevelopment Plan, the application creates an environment in which goals and objectives can be achieved. Unlike other EDC submissions reviewed by USACERL, the success of the EDC and Redevelopment Plan rests largely with an educational public benefit conveyance (PBC) to the University of Colorado Health Sciences Center (UCHSC). The relationship between UCHSC and the proposed EDC is important in evaluating the ability of the application in meeting the goals expressed in the Redevelopment Plan.

Business Plan Review and Market and Financial Feasibility (Chapter 4)

The FRA is requesting an EDC to acquire approximately 332 acres of Fitzsimons Army Medical Center along with water, wastewater, storm water, gas and steam utility systems, and 1.4 million sq ft of building space for a proposed consideration of \$1 million. USACERL concludes that the applicant's proposed business plan for the redevelopment of Fitzsimons adequately demonstrates financial feasibility through a long-term approach to investment and job creation, potential access to external financing sources, and a well-reasoned implementation plan, but is enhanced through USACERL scenario development. The net present value (NPV) of the business plan for the 25-yr project analysis period, as estimated by the FRA, was calculated to be *positive* \$1.2 million. USACERL's developed alternative scenario for the business plan produced an NPV range of *positive* \$2.6 million to \$4.6 million.

The centerpiece of the applicant's EDC business plan is the 147-acre bioscience park, which can potentially accommodate over 1.5 million sq ft of new bioscience and related uses. However, other land uses are contemplated to complement the bioscience park and University of Colorado Health Sciences Center (UCHSC). These land uses include commercial, retail, multi-family residential, flex office/industrial, and recreation. Key components and assumptions of the FRA's business plan include:

- Average bioscience park absorption of 62,400 sq ft/yr over 25 yr (1.56 million sq ft) can only be achieved through the active presence of UCHSC and operational and economic synergies fostered between the FRA and UCHSC (e.g., consultation with faculty, access to specialized equipment and facilities, etc.)
- The Economic Development Administration (EDA) bioscience incubator will be a catalyst for early development and an ongoing stream of bioscience "graduates" to the Bioscience Park
- Infrastructure improvements totaling \$31.4 million, a majority of which will arise from demolition, will only be made when development warrants it to reduce overall borrowing costs (i.e., "pay-as-you-go" system)
- The 18-hole golf course will be operated for 18 years (Year 2016) at which time it will be prepared for Phases III and IV of the Bioscience Park
- 25-yr development revenues total \$83.4 million, the majority of which (\$49.4 million) is derived from the bioscience park, with the balance derived from existing building leasing, golf course revenues, and ground lease revenues
- 15-yr projected operating expenses total over \$28.2 million, the majority of which (\$21.4 million) stem from administration and marketing
- The FRA proposed to fund 25-yr operational shortfalls through the potential use of tax increment finance (TIF) bond issues, EDA grant funding, and City of Aurora and State of Colorado sources
- A project discount rate of 15 percent is applied to pro forma cash flows

USACERL's CERL1 Scenario represents two project assumptions that test the overall financial feasibility of the FRA business plan. First, USACERL's market feasibility analysis revealed that the FRA's projected absorption rates and full buildout are achievable given (1) UCHSC's relocation schedule and proposed level of investment into Fitzsimons, (2) the FRA's infrastructure improvement program and implementation plan which soundly supports bioscience end users, and (3) favorable bioscience trends locally and nationally. However, in response to the well-known volatility of the industry in general and the dominant competitive presence of Boulder County as a currently favored bioscience location, USACERL reduced bioscience park absorption:

- Total 25-yr bioscience park absorption decreased from 1.56 million sq ft to 1.3 million sq ft, decreasing total revenues from \$83.9 million to \$80.5 million

- Project NPV decreases from *positive* \$1.2 million to *negative* \$0.31 million and *positive* \$0.65 million at 15 and 11% discount rates, respectively

The second assumption change relates to USACERL's infrastructure findings. Although USACERL found the FRA's development infrastructure program to be generally sound in terms of approach and supportive of job-creation goals, some notable findings were revealed that led to a reduction in overall proposed costs. The most significant infrastructure cost findings were related to demolition, bioscience park improvements, and roads. Findings from the CERL1 Scenario change are as follows:

- Total 25-yr development infrastructure costs are reduced from \$31.4 million to \$25.5 million
- Project NPV increases from *positive* \$1.2 million to \$2.4 and \$4.3 million at 15 and 11 percent discount rates, respectively

In addition to the two scenarios presented, USACERL also developed an alternative project view. The project view addresses the apparent omission of the sale of reusable buildings at the end of the 15-yr planning horizon. According to the FRA, nearly 107,000 sq ft of existing building space will be leased through Year 25 (2022), yet no mention is made as to how these buildings will be managed or disposed of beyond that time. USACERL assumed that the FRA would sell the buildings to investors in Year 2022 for \$4.0 million (assumes 50% operating cost ratio and a 15% capitalization rate).

When CERL1-recommended assumption changes are applied to the FRA business plan, a new range of project NPVs is calculated. Without a Year 25 sale of reusable buildings, the FRA business plan is found to be financially feasible as evidenced by calculated NPVs ranging from *positive* \$2.4 million to \$4.3 million at 15 and 11% discount rates. When Year 25 building sales of \$4 million are applied, the indicated value of the FRA business plan rises to *positive* \$2.6 million to \$4.6 million, and thus is the amount of monetary consideration that could be defended in negotiations with the FRA.

Need and Extent of Proposed Infrastructure Improvements (Chapter 5)

According to the FRA, development infrastructure costs required to bring the Fitzsimons EDC parcel up to marketable, code compliant, and functional standards total \$31.4 million (\$23.0 million in 1998 constant dollars). The categories of infrastructure improvements include: (1) roads - \$5.9 million, (2) domestic

water - \$1.4 million, (3) sanitary sewer - \$1.0 million, (4) storm water - \$2.6 million, (5) demolition - \$13.7 million, and (6) bioscience park improvements - \$6.7 million. In terms of infrastructure phasing, the FRA has proposed a judicious strategy whereby only 17.5 percent of infrastructure improvements are programmed within the first 5 years of redevelopment while the market for Fitzsimons property is tested. It was the finding of USACERL that the FRA's infrastructure costs as a total fall slightly above an independent cost range of reasonableness.

As to need and extent, USACERL noted several significant findings that lowered overall proposed development costs. First, the FRA's proposed \$13.7 million outlay for demolition is most likely an overstatement of project requirements. USACERL's independent review of installation documents revealed a lower level of crawlspace asbestos than the FRA had assumed (\$13.7 million vs \$10.6 million). Second, USACERL took exception to the FRA's \$6.7 million bioscience park costs because applicable park acreage was likely overstated and costs to extend steam and condensate lines were erroneously included (\$6.7 million vs \$4.9 million). The FRA has assumed in the EDC business plan that the central heating plant and supporting steamlines will be decommissioned in 2 yr. Third, USACERL noted some minor differences in road and wet utility cost estimates that likely overestimate system costs by \$1.8 million. In summary, USACERL independently reduced required infrastructure costs by nearly \$5.9 million to a new total of \$25.5 million, which enhances overall financial feasibility while simultaneously supporting job-creation goals.

Extent of State and Local Investment and Risk (Chapter 6)

The level of operating and capital investment and scope of redevelopment observed at Fitzsimons are substantial, totaling nearly \$59.6 million. The FRA has outlined an investment strategy that soundly accommodates job-creation goals while simultaneously reducing operating and infrastructure investment risks, in spite of an inherently risky bioscience reuse. USACERL's CERL1 Scenario improves the prospects for risk management and financial feasibility through independently supportable assumptions that improve 25-yr cash flows. In addition, external sources of project financing, including the Economic Development Administration (EDA), State of Colorado, and City of Aurora, may contribute grant or debt funding to invest in job creation and reduce projected operational shortfalls. Nevertheless, this level of local investment by the FRA should be looked upon favorably by the Army in negotiating the final terms and conditions of the transfer agreement.

Local and Regional Real Estate Market Conditions (Chapter 7)

In general, USACERL confirms the market analysis and findings presented in the FRA's reuse plan and EDC application. Driven by the strength of the regional economy, the availability of modern municipal infrastructure to support new development, and other contributing factors, the real estate market in the Denver metropolitan area is continuing to experience sustained growth. The Fitzsimons site offers a unique location within the Aurora submarket given its proximity to Denver International Airport and the larger Airport/Montbello sub-market to the north. Thus, although Fitzsimons faces substantial competition from alternative development sites, given the current strength of the regional market, USACERL supports the FRA's finding that Fitzsimons can successfully compete for an adequate share of tenants if the existing facilities are marketed at below average market rates.

The Army's Disposal Plan, Other Federal Agency Concerns, and Other Property Disposal Authorities (Chapter 8)

As part of the EDC application review process adopted by the BRAC office at HQUSACE and presented at a Corps of Engineers Real Estate Workshop in Denver, CO, in December 1995, USACERL has been asked to defer comment on these issues to the Real Estate Directorate at HQUSACE and the Corps of Engineers, Omaha District. In addition, both the negotiation process leading up to the submittal of the formal EDC application and review of the legal environment related to real and personal property are beyond the scope of USACERL's technical review.

Economic Benefit to the Federal Government (Chapter 9)

Based on the eligibility factors/criteria reviewed for this report, it is the opinion of USACERL that the applicant is eligible for an Economic Development Conveyance. USACERL recommends that the Army consider up to \$3.0 million in facility layaway and annual maintenance and repair costs when negotiating the final terms and conditions of the conveyance. It is also USACERL's recommendation that the Army look favorably upon the FRA's level of investment, which will likely create over 3,700 jobs, when deciding if a discount from fair market value (FMV) is warranted. Finally, the USACERL-estimated range of business plan value is *positive* \$2.6 million to \$4.6 million compared with the FRA's offer of \$1 million, but the Army's final determination of value and possible consideration must rest largely on the results of a negotiation

process between the Army and the FRA and the results of the Army's FMV appraisal process.

Review of Application for Completeness (Chapter 10)

USACERL concludes that the FRA's EDC application is complete. The application includes a complete project narrative, EDC contributions to job creation and economic development, a business plan, justification for use of the EDC process, and a statement of the FRA's legal authority to acquire and dispose of property.

Foreword

This study was conducted for the Base Realignment and Closure (BRAC) Office, Headquarters, U.S. Army Corps of Engineers, and funded through the BRAC Office, Office of the Assistant Chief of Staff for Installation Management (ACSIM-DAIM-BO) under Military Interdepartmental Purchase Request (MIPR) 8ACERB3003, dated 10 October 1997. The technical monitor was Gary B. Paterson, CERE-C.

The work was conducted by the U.S. Army Construction Engineering Research Laboratories (USACERL) by the following divisions and laboratories: Environmental Processes Division (PL-N) of the Planning and Management Laboratory (PL); Utilities Division (UL-U) and Troop Installation Operations Division (UL-T) of the Utilities and Industrial Operations Laboratory (UL); and the Maintenance Management and Preservation Division (FL-P) of the Facilities Technology Laboratory (FL). L. Jerome Benson is Division Chief, PL-N, Walter J. Mikucki is Acting Division Chief, UL-T, Martin J. Savoie is Division Chief, UL-U, and Dr. Simon S. Kim is Division Chief, FL-P. L. Michael Golish is Operations Chief, PL, and Acting Operations Chief, FL, and Dr. John Bandy is Operations Chief, UL.

The following USACERL employees worked on specific sections of this document: Jeffrey Bogg, PL-N (EDC Project Leader, Business Plan Review and Market and Financial Feasibility, Economic Benefit to the Federal Government, Extent of State and Local Investment and Risk); Samuel Hunter, FL-P, Jeffrey Kirby, PL-E, and Michael Brewer, Thomas Durbin, and Chris Dilks, UL-U (Need and Extent of Proposed Infrastructure Improvements); Jane DeRose, PL-N (Demolition and Facility Layaway and M&R); Gary Gerdens, UL-T (Wet Utilities); Richard Schneider, PL-N (Demolition and Building Fit-up); Shawn Hill and Jonathan Trucano, PL-N (Economic Impact Analysis, Job Creation, Reuse Plan Consistency). The USACERL managing technical editor was Linda L. Wheatley, Technical Information Team.

Dr. Michael J. O'Connor is Director of USACERL.

Contents

SF 298	1
Executive Summary	3
Foreword	10
Introduction.....	15
Background.....	15
Objective	17
Tasking and Approach.....	18
Units of Weight and Measure	19
1 Adverse Economic Impact of the Closure on the Region and the Potential for Recovery After the EDC	25
Background.....	25
Methodology	25
Review of EDC Application Assumptions and Methodology	26
Adverse Economic Impact of the Closure of Fitzsimons	28
Potential for Economic Recovery	30
Conclusion	31
2 Extent of Long-Term Job Creation.....	32
Overview	32
Background and Approach	32
Process Methodology	33
Extent of Long-term Job Creation	34
Caveats	36
Reconciliation of Job Creation Projections and Closure Impacts	37
Conclusion	37
3 EDC Application's Consistency With the Overall Redevelopment Plan	39
Background.....	39
Conclusions	39

4 Business Plan Review and Market and Financial Feasibility Analysis	42
Objective	42
Background.....	43
Approach.....	44
Business Plan Review and Findings.....	46
Market Feasibility Analysis.....	70
USACERL-Developed Scenario	72
Scenario and Sensitivity Analysis.....	74
Financial Feasibility Analysis	74
Conclusion	76
5 Need and Extent of Proposed Infrastructure Improvements	77
Objectives	77
Approach.....	77
Background.....	79
Conclusions	94
6 Extent of State and Local Investment and Risk	95
Background.....	95
Approach.....	95
Operational Investment and Risk.....	96
Capital Improvements	97
Conclusions	99
7 Local and Regional Real Estate Market Conditions	100
Methodology	100
Background.....	100
Site Configuration	101
Access.....	101
Contiguous Land Uses.....	102
Market Analysis.....	102
Conclusion	107
8 Army Disposal Plan, Other Federal Agency Concerns, and Other Property Disposal Authorities	108
9 Economic Benefit to the Federal Government.....	109
Introduction	109
Conclusions	109
Anticipated Consideration from the Conveyance.....	112
Recommendation	113
10 Review of Application for Completeness	115

References	117
Appendix A: Caveats and Employment Multipliers by Standard Industrial Classification Code.....	119
Appendix B: Operations and Business Plan Analyses	131
Appendix C: Fit-Up Assumptions and Technical Support for Infrastructure Improvement Cost Estimates.....	151
Distribution	

List of Figures and Tables

Figures

1	Geographic relationship of Fitzsimons with the greater Denver Region.....	20
2	Immediate vicinity of Fitzsimons site.....	21
3	Fitzsimons Reuse Plan.	23
4	Real estate submarkets for the Denver Metropolitan Area.	24

Tables

1.1	Adverse economic impact of Fitzsimons closure.....	30
2.1	USACERL long-term job-creation estimate.....	35
4.1	Proposed EDC land uses and existing acreage.	43
4.2	FRA residential rental rates.....	62
4.3	FRA pricing strategy for reusable buildings.	63
4.4	Summary of proposed reuse and pricing for reusable buildings.....	63
5.1	FRA cost estimates including contingency and soft costs.	80
5.2	Cost comparison by infrastructure system.....	82
5.3	Infrastructure need and extent cost comparison (CERL1).....	82
5.4	Existing steam system HEATMAP data.	91
5.5	Campus system cost estimate	92
5.6	Estimated fit-up costs.....	94
7.1	1997 Office Market Overview.	104
7.2	1997 Industrial Market Overview.....	106
9.1	One-time layaway cost estimates for the Fitzsimons EDC parcel.	110
9.2	Annual M&R cost estimates for the Fitzsimons EDC parcel.....	110
9.3	Likely Army layaway and M&R commitments.	112

Introduction

Background

The Fitzsimons Army Medical Center (AMC) Economic Development Conveyance (EDC) parcel consists of approximately 332 acres and 1.4 million sq ft of building space in Adams County, CO. Fitzsimons is approximately 8 mi east of downtown Denver in the northern quadrant of the City of Aurora. The site has good access to population and commercial centers in both the city and surrounding region due to its proximity to regional expressways and arterials. Primary site ingress and egress is achieved by East Colfax Avenue, a major east-west arterial that provides convenient access to I-70 to the east and downtown Denver to the west, and that also represents the southern boundary of Fitzsimons. Secondary site access is from Peoria Street, which serves as the western boundary of the site and provides almost immediate access to I-70 (see Figures 1, 2, and 3 beginning on page 20). The areas surrounding Aurora are characterized by a variety of highly developed land uses that include residential, commercial, and small amounts of light industrial use. In general, Fitzsimons lies within what is known as the "East" industrial and office submarket, which primarily includes the city of Aurora (Figure 4).

When Fitzsimons was slated for closure by the 1995 Base Realignment and Closure (BRAC) Commission, the City of Aurora established the Fitzsimons Redevelopment Advisory Committee (FRAC) and subsequent Fitzsimons Redevelopment Authority (FRA) to facilitate the reuse and economic redevelopment of the surplus parcels. Since the 1995 announcement, the Army has begun to demobilize the surplus parcels in anticipation of the EDC and mandatory operational closure in September 1999. The FRA and Army have begun work on conveyance/leaseback arrangements and transfer plans in anticipation of the approval of the proposed EDC.

Concurrent with the FRAC's reuse planning process, the University of Colorado Health Sciences Center (UCHSC) expressed interest in locating a new campus at Fitzsimons and ultimately filed an educational public benefit conveyance (PBC) application with the Army and Department of Education. This application was viewed by the FRAC as providing a catalytic use for the site that was otherwise

not outwardly available. Accordingly, the FRAC integrated the UCHSC vision, objectives, and implementation strategies into the January 1997 Fitzsimons Redevelopment Plan. The redevelopment of Fitzsimons is unique in that the primary engine for job creation and economic development will be a PBC recipient. As a result, USACERL's technical evaluation strongly considered the UCHSC's impact on EDC market and financial feasibility.

On 2 July 1993, President Clinton announced a major new policy to speed the economic recovery of communities adversely affected by military base closures or realignments. The President requested that Congress provide additional authority to expedite the reuse of closing military bases, in an effort to create new jobs and reestablish the economic base. Congress provided this new authority (commonly called the "Pryor Amendments") and subsequent amendments as Title XXIX of the National Defense Authorization Act (NDAA) for Fiscal Year (FY) 1994. The Department of Defense (DoD) has recently codified the final implementing regulations for this legislation at 32 CFR 90-92, "Revitalizing Base Closure Communities." Collectively, these new rules are intended to facilitate the conveyance (transfer of military real and personal property) from the Federal government to an approved Local Redevelopment Authority (LRA).

These new regulations created a new property transfer authority called an Economic Development Conveyance (EDC), which gives greater flexibility to the military departments and affected communities to negotiate the terms and conditions of the conveyance if specified criteria are met. On 15 January 1998, the FRA, acting as the approved LRA, filed an EDC application with the Chief of the Base Realignment and Closure Office at Headquarters U.S. Army Corps of Engineers, for the conveyance of certain parcels at Fitzsimons. Included as part of the EDC application was a copy of the Fitzsimons Redevelopment Plan and Master Infrastructure Plan and supporting technical appendices.

In general, the FRA has requested that the Army transfer the EDC parcel under the following general terms and conditions:

1. The FRA will pay the Army \$1 million amortized over 5 years beginning in 2012 at a 6% interest rate; interest will not begin accruing until 2012.
2. Real property will be transferred via a quitclaim deed.
3. Personal property will be transferred by bill of sale.

4. The proposed purchase price was calculated assuming all housing units contain lead-based paint hazards, which will require remediation. If the Army will, at its sole expense, perform the testing required to determine that less than all the housing units require remediation, the FRA will adjust the purchase price accordingly.
5. EDC parcels will be conveyed as they become environmentally cleared and available for transfer by deed. Parcels unavailable for deed transfer will be requested under a lease in furtherance of a conveyance.
6. The Army will continue to operate the central steam plant for up to 24 months after closure to allow time for reusable buildings to be retrofitted with individual package boilers.
7. If required, the Army will subordinate their interest in the property in order to allow the FRA or other parties to obtain financing.
8. The Army will decommission, environmentally clean, and demolish the current wastewater treatment plant and provide a connection to the metropolitan sanitary sewer system. The Army will also connect the golf course irrigation system to the potable water supply system.
9. The FRA will have a right of first refusal to include in this EDC, or acquire by other means of conveyance, any Fitzsimons site currently being requested under a different transfer authority if such transfer cannot be completed.

Subsequent to the receipt of the application by Headquarters, U.S. Army Corps of Engineers, the U.S. Army Construction Engineering Research Laboratories (USACERL) was tasked by headquarters to provide a technical review of the FRA EDC application, evaluating it for compliance with 32 CFR Part 91 and related regulations. This report comprises USACERL's findings and conclusions.

Objective

The objective of this study was to technically evaluate the FRA EDC application in terms of:

1. validity of the information provided by the FRA
2. completeness of the application according to the criteria and factors specified in the DoD regulations governing rural EDCs.

The objective of this report is to document the study's findings, noting any deficiencies found in the application, and to attempt to address those deficiencies.

Tasking and Approach

The FRA's EDC application was technically reviewed by a multidisciplinary work group formed and managed through the USACERL Planning and Management Laboratory (PL). With guidance from DAIM-BO, the USACERL work group conducted a site visit to Fitzsimons during the week of 25-27 February 1998. The purpose of the site visit was to collect source data and information with respect to the FRA's request for an EDC. Most of the group's analytical work and documentation occurred between 2 March and 4 May 1998.

Validity of the information provided on the EDC application was determined by following a protocol specifically developed to demonstrate how the substance of the application meets the criteria in the DoD implementing regulations related to EDCs. Using data provided in the EDC application and supporting documents as well as data gathered independently by team members, USACERL evaluated the application according to the following criteria and factors:

- adverse economic impact of closure on the region and potential for economic recovery after an EDC
- extent of long-term job generation
- consistency with the overall Redevelopment Plan (i.e., the Fitzsimons Redevelopment Plan)
- financial feasibility of the proposed development, including market analysis, and the need and extent of proposed infrastructure improvements
- extent of state and local investment and risk incurred
- current local and regional real estate market conditions in the affected area
- relationship to the overall Military Department disposal plan for the installation, incorporation of other Federal agency interests and concerns, and applicability of, and conflicts with other Federal property disposal authorities

- economic benefit to the Federal government, including protection and maintenance cost savings and anticipated consideration from the transfer.

Another criterion to be reviewed under the EDC implementing regulations is the proposed EDC's compliance with applicable Federal, state, and local laws and regulations. This type of legal review falls beyond the scope of USACERL's tasking and expertise, and is not addressed in this report.

After evaluating the validity of the information provided in the EDC application, USACERL determined whether the application was complete in terms of the seven criteria specified in the EDC implementing regulations. (These criteria are discussed in Chapter 10, **Review of the Application for Completeness**.)

Finally, the USACERL work group compiled its findings into this report and a briefing for the sponsor. The final briefing was given to Army decisionmakers on 6 May 1998.

Units of Weight and Measure

U.S. standard units of measure are used throughout this report. A table of conversion factors for Standard International (SI) units is provided below.

SI conversion factors	
1 in.	= 25.4 mm
1 ft	= 0.305 m
1 sq in.	= 6.452 cm ²
1 sq ft	= 0.093 m ²
1 sq yd	= 0.836 m ²
1 cu in.	= 16.39 cm ³
1 cu ft	= 0.028 m ³
1 cu yd	= 0.764 m ³
1 gal	= 3.78 L
1 mi	= 1.61 km
1 psi	= 6.89 kPa
1 lb	= 0.453 kg
°F	= (°C x 1.8) + 32

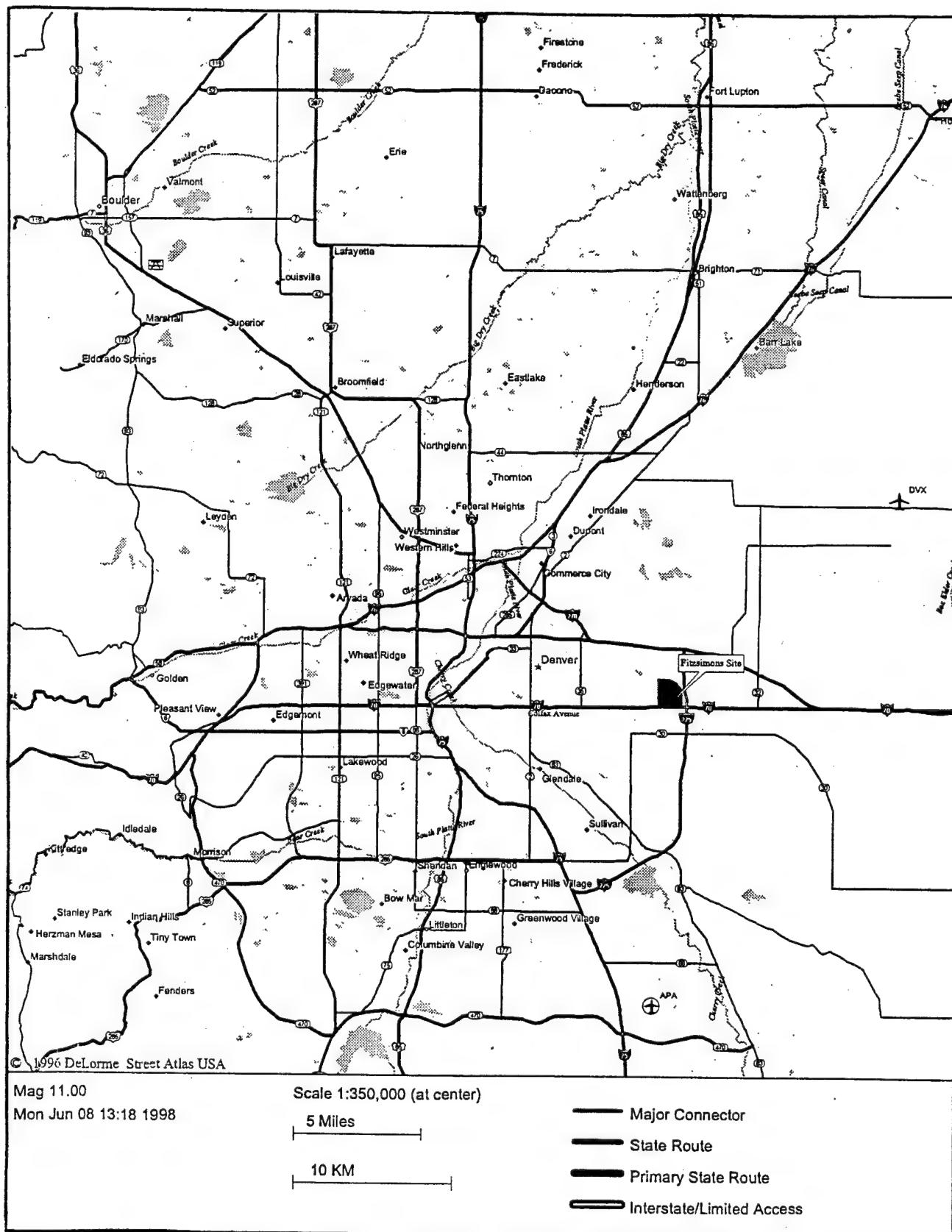


Figure 1. Geographic relationship of Fitzsimons with the greater Denver Region.

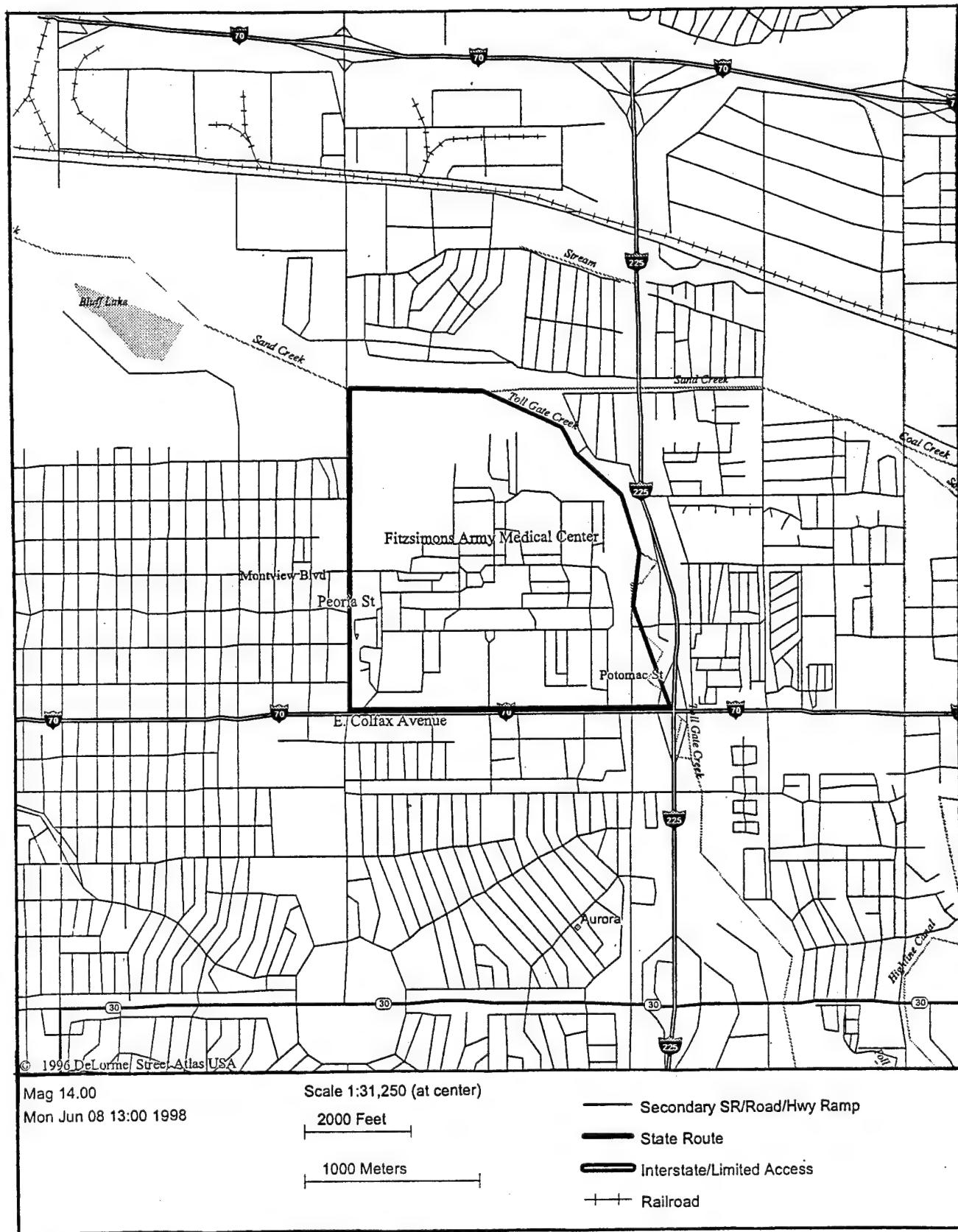


Figure 2. Immediate vicinity of Fitzsimons site.

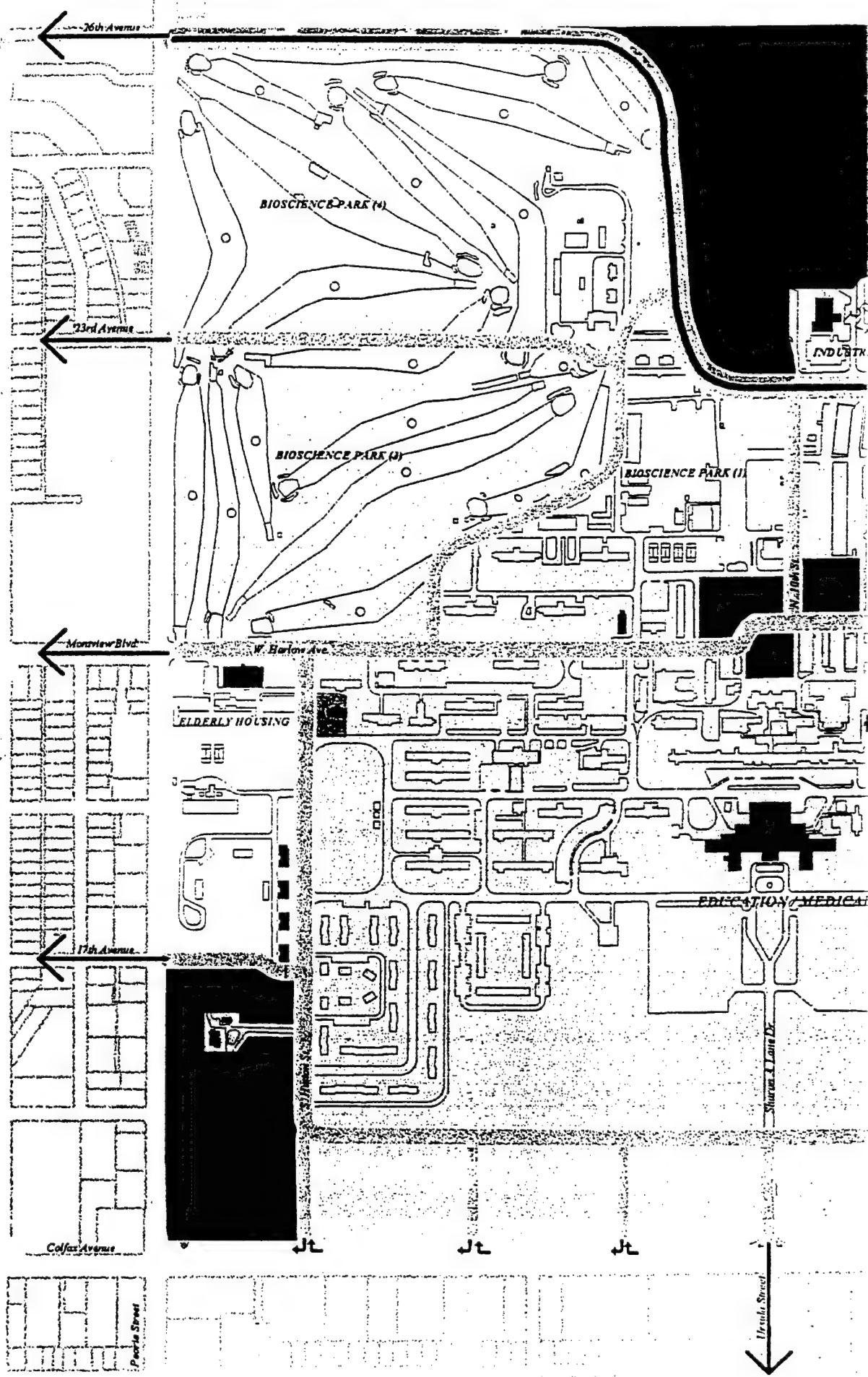
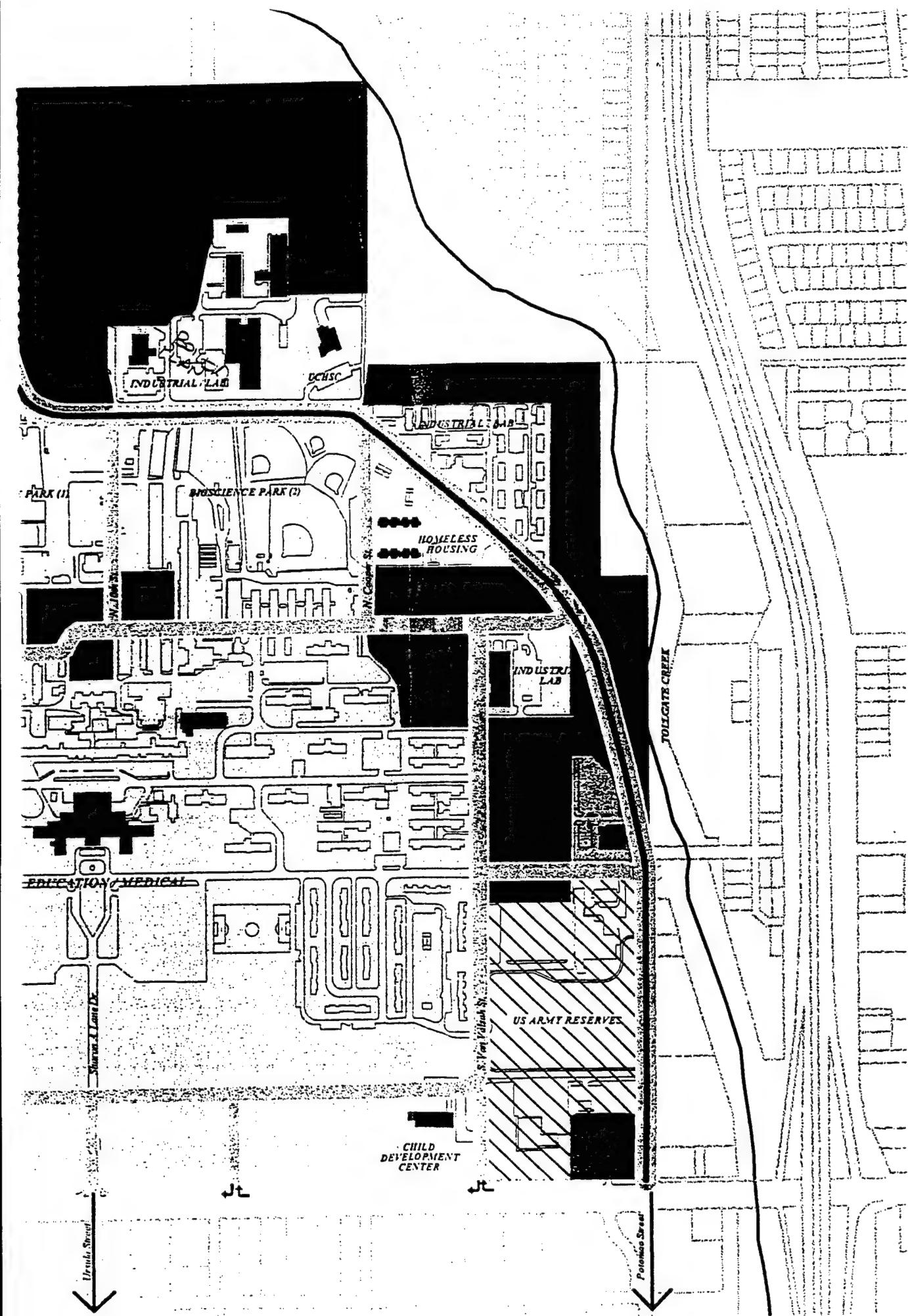


Figure 3. Fitzsimons Reuse Plan.



FITZSIMONS LAND USE at Buildout

LEGEND

-  Medium Density Housing
-  Lodging
-  Education / Medical
-  Commercial
-  Service
-  Industrial / Lab
-  Education
-  Public
-  U. S. Army
-  Bioscience Park
-  Park / Recreation

600 300 0 600 Feet



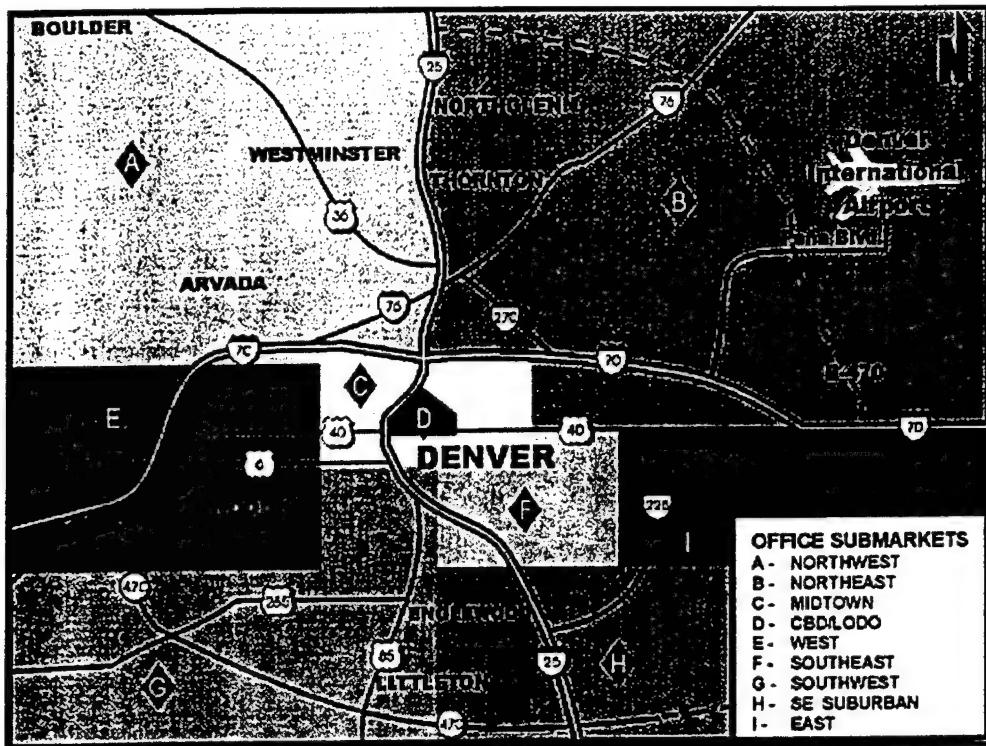
FITZSIMONS
REDEVELOPMENT PLAN



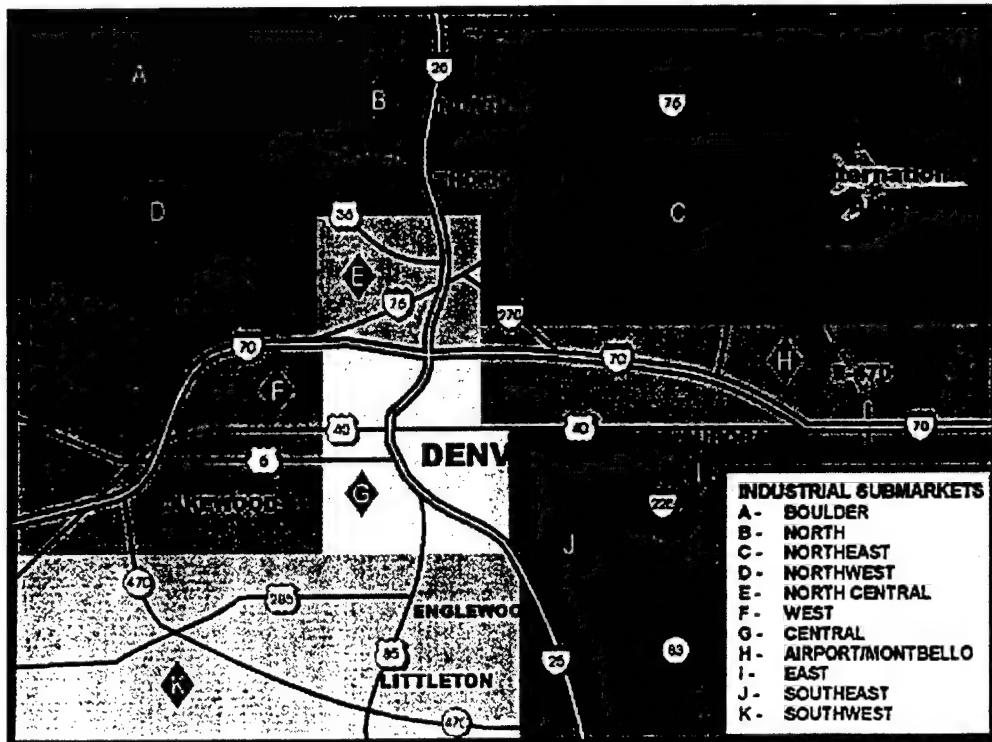
BRW, Inc.

Economic and Planning Systems • Harold Massop Associates Architects,
Davis Partnership, P.C., Architects • Woodward-Clyde Consultants
W.B. Bishop and Associates

Office Submarket



Industrial Submarket



(Source: Grubb & Ellis 1998.)

Figure 4. Real estate submarkets for the Denver Metropolitan Area.

1 Adverse Economic Impact of the Closure on the Region and the Potential for Recovery After the EDC

Prepared by:

Shawn R. Hill, Community Planner

Jonathan D. Trucano, Community Planner

USACERL, ATTN: CECER-PL-N

P.O. Box 9005

Champaign, IL 61826-9005

(217) 352-6511 x6307

Background

Pursuant to 32 CFR §175, the prescribed content of the Economic Development Conveyance (EDC) application must include a description of the economic impact of a base closure on the local communities. This chapter addresses these concerns by examining the extent of closure impacts and whether the proposed Fitzsimons Army Medical Center EDC request will facilitate a recovery of lost jobs and revenues.

Methodology

To determine economic impacts from the closure of Fitzsimons, USACERL first reviewed the Fitzsimons EDC Application, the January 1997 Reuse Plan, the U.S. Army Final Environmental Impact Statement (FEIS), and other referenced documents to determine the extent of the adverse economic impact experienced in the Denver region as a result of the closure. USACERL found that, while these documents describe some of the adverse impacts that have resulted from the closure, they do not present a sufficiently comprehensive socioeconomic analysis of possible closure and reuse scenarios to make a cogent determination.

Accordingly, USACERL chose to use a two-part analysis for evaluating the Fitzsimons EDC application. For part one, USACERL examined the assumptions

and methodologies used to develop the impact estimates in the EDC application for their internal consistency and appropriateness. In part two, USACERL developed independent estimates of the likely impacts of the closure. In developing these independent estimates, USACERL relied primarily on Implan Pro v1.1, a software program that uses a standard input-output modeling methodology to generate impact multipliers from county-level economic data. Implan Pro has been used extensively by private and public entities to quantify positive and negative economic effects that may result from a wide array of investment scenarios, including the closure of military bases.

Review of EDC Application Assumptions and Methodology

USACERL's review of the economic impact estimates presented in the EDC application suggests that these estimates suffer from at least two methodological shortcomings, both of which probably caused the impact estimates to be dramatically overstated. These limitations are delineated as follows.

Choice of Region of Impact

The first weakness in the application methodology relates to the choice of an overly small region of impact (ROI). An ROI is a geographic area selected as a basis on which social and economic impacts of project alternatives are analyzed. It is important to realize that any given economic effect will almost never have the same boundaries as a city or county. Accordingly, the choice of an ROI can have a significant impact on the results of a socioeconomic analysis; more specifically, an overly small ROI tends to neglect important regional economic interrelationships and thus incorrectly amplifies perceived local impacts.

The 1997 Reuse Plan identified the five-county Denver Primary Metropolitan Statistical Area (PMSA) as the primary region of economic and market influence for Fitzsimons redevelopment potential.* Alternatively, USACERL defined a seven-county ROI, which included Boulder and El Paso counties, in addition to the five counties selected by the reuse plan and EDC application. The criteria used to determine this ROI were residency distribution of installation employees, the commuting distances and times, and the location of businesses providing goods and services to the installation and its personnel and their dependents.

* The five-county PMSA generally includes the counties of Adams, Arapahoe, Denver, Douglas, and Jefferson.

installation, including housing, public services, and transportation. The Final Environmental Impact Statement (EIS) also recognized this fact, and defined a similar primary ROI in conducting its analysis.

Since the detrimental impacts of closure will likely be distributed throughout a region larger than just the Denver PMSA, USACERL finds that the EDC application inappropriately focuses its socioeconomic impacts. Therefore, the relative significance of these impacts has probably been overstated in the EDC application.

Overstatement of Onsite Employment and Effects of Job Placement Efforts

A second reason that the economic impacts are likely to have been overstated relates to the estimated employment onsite, as well as the lack of consideration given to net positive impacts of job replacement efforts in the impacted region. Based on figures obtained from Fitzsimon's personnel,[†] USACERL was unable to confirm impact numbers presented in the EDC application and reuse plan regarding the number of military and civilian personnel employed by the installation for fiscal year (FY) 1994. Specifically, the EDC application cites estimated onsite employment at 4,875 jobs; alternatively, USACERL sources indicate onsite employment, including tenant organizations, at approximately 2,935.

Additionally, while it is true that lost employment detrimentally affects a local economy, it is also true that such effects can be largely mitigated if laid-off persons are able to find similar new employment in the same region.[‡] USACERL sources indicate that many of the former Fitzsimon's employees have found alternative employment or been realigned locally. The EDC application apparently trivializes the significance of this fact and bases its impact analysis on the assumption that every former Fitzsimon's employee will either leave the area or be unable to find a new job. More simply, the EDC application calculates what might have been the theoretical "worst-case" scenario for economic impact, rather than the likely actual impact.

* Refer to Final EIS for BRAC 95 Disposal and Reuse of the Fitzsimons, Aurora, CO, p 4-42.

† USACERL 1994 employment data obtained from Fitzsimons Directorate of Resource Management.

‡ This fact assumes that the new position is substantially similar in type and compensation to the old position.

These omissions were particularly evident in light of the fact that roughly 700 of the 1,134 tenant employees present at the date of closure will remain employed in the Denver metropolitan region. Specifically, the application fails to net the corresponding impacts out of its aggregated analysis; these effects are particularly significant given that they account for greater than 60% of all tenant employment onsite. Finally, according to the job placement specialist working at Fitzsimons,* many of the former civilian and military personnel have accepted jobs or taken transfers locally. The EDC application does not address these efforts, nor do the calculations presented evince the inclusion of their effects. For these reasons, USACERL finds that it is highly likely that the total impact estimates presented in the EDC application are overstated.

Adverse Economic Impact of the Closure of Fitzsimons

After developing independent estimates of the closure impacts for Fitzsimons, USACERL was unable to confirm the estimates presented in the EDC application. Although the EDC application correctly notes that Fitzsimons was a large employer in the Denver metropolitan area, USACERL finds that actual closure impacts will probably be substantially lower than the estimates presented in the EDC application.

Assumptions

USACERL's independent impact estimates relied on the following assumptions:

- Approximately 20% of employees' salaries and wages are paid to Federal and state governments in the form of taxes[†]
- The consumption patterns of civilian employees and contractors are similar to the consumption patterns of other middle-class residents in the determined ROI

* These facts were obtained from Linda Lemois in the office of the Directorate of Resource Management at Fitzsimons.

† Twenty percent is an approximate figure because some forms of taxation are difficult to measure directly. For example, vehicle licensing fees, service fees, or other similar municipal fees are economically similar to taxes, but can be difficult to capture using an input-output approach.

- Spousal employment patterns for Fitzsimons employees are similar to spousal employment patterns in the determined ROI
- "Employee compensation" includes all salaries and wages, as well as life and health insurance, pension payments, and any other non-cash compensation.

Findings

USACERL's independent analysis indicates that the total impacts associated with the closure of Fitzsimons will generally be about 60 to 80 % larger than the direct losses associated with the base closure itself. More specifically, USACERL found that, for each dollar spent directly on base activities, the surrounding communities will lose about \$1.80 in total output, and for each job lost at Fitzsimons, the area will lose a total of about 1.62 jobs. USACERL's findings are consistent with similar findings presented in studies of short-term base closure impacts.* Note that short-term impacts will generally be the most obvious and pronounced, as the local economy stabilizes and clears excess capacity and resources.

USACERL's independent analysis also indicated that many, if not most, of the civilian employees and contractors of Fitzsimons will probably not leave the area to seek new employment, further limiting likely impacts on the area. USACERL did not develop exact estimates of the number of people leaving, both because of the volume of available data and the lack of consistency within it; however, it appears clear that at least 700 of the 3,000 (23%) employees present during the closure year of 1995 have remained employed locally.[†]

* See, e.g., National Defense Research Institute, "The Effects of Military Base Closures on Local Communities: A Short-term Perspective," Rand Institute.

[†] To reach this estimate, USACERL queried a variety of sources, including the Final Environmental Assessment, and personnel associated with the office of the Directorate of Resource Management at Fitzsimons; estimates from the FRA redevelopment plan were also considered.

In more absolute terms, USACERL's findings are as follows:^{*}

Table 1.1. Adverse economic impact of Fitzsimons closure.

Type of Impact	USACERL ESTIMATES		FRA ESTIMATES	
	Gross Output (\$) ^a	Employment (Jobs)	Gross Output (\$) ^a	Employment (Jobs)
Direct	\$126.50	3,000	\$202.90	7,047
Indirect and Induced	\$ 94.10	1,920	\$125.10	5,269
Total Impacts	\$220.60	4,920	\$328.00	12,316

* Denotes output in millions

Since USACERL was able to obtain only gross figures that did not delineate specific budget expenditures, the above lost output and lost income figures only do not fully reflect possible mitigation measures that have been undertaken since the closure was announced. In addition, since only the known local tenant relocations were subtracted out of the aggregate employment data, and given that many former military and civilian personnel were also employed locally,[†] USACERL is confident that the calculated estimates most likely overstate actual impacts. However, because USACERL was unable to extrapolate some exact pertinent information regarding average compensation, total employment figures, and exact numbers of personnel that will remain employed locally, the estimates used in the analysis were designed to reflect a compromise and relate general orders of impact magnitude.

Potential for Economic Recovery

USACERL's independent analysis indicates that, although the total closure impacts may be fairly significant, a strong potential exists for a full recovery in the region. Given that a 217-acre campus for the UCHSC is being developed on the former Fitzsimons site, reuse potential is already evident; the project involves at least \$50 million invested by 1999 and will eventually approach \$2.0 billion over the next 20 to 25 years. In addition, the facility will eventually employ more than 14,000 people; however, job creation is discussed in more detail in Chapter 2, **Extent of Long-Term Job Creation**. Nevertheless, a full recovery appears likely even with very conservative job-creation estimates.

* Estimates of salary and non-salary expenditures at Fitzsimons that were used in the Implan model were 1995 data taken from the U.S. Army FEIS. Employment data were obtained from the Fitzsimon's Directorate of Resource Management in conjunction with the 1997 FRA Redevelopment Plan.

[†] As per the Fitzsimon's Directorate of Resource Management.

Conclusion

The impact analysis presented in the EDC application suffers from a series of theoretical and practical limitations that overstate the socioeconomic impacts. The first weakness in the application methodology relates to the choice of an overly small ROI. In addition, the economic impacts are likely to have been overstated due to an inflated estimate of onsite employment, as well as the lack of consideration given to job replacement efforts in the determined ROI.

Specifically, the FRA estimated that total detrimental impacts are expected to be on the order of 12,316 direct and indirect jobs, accounting for \$328 million in total output. By contrast, USACERL determined that impacts would likely amount to 4,920 direct and indirect jobs, or \$220 million in gross output. In any case, even under the most conservative assumptions, a full economic recovery from the closure of Fitzsimons will be likely, particularly given the relative insignificance of the closure on the regional economy.

2 Extent of Long-Term Job Creation

Prepared by:

Shawn R. Hill, Community Planner

Jonathan D. Trucano, Community Planner

USACERL, ATTN: CECER-PL-N

P.O. Box 9005

Champaign, IL 61826-9005

(217) 352-6511 x6307

Overview

The EDC application for Fitzsimons AMC is required by Federal law to discuss job creation prospects for the proposed reuse of the Fitzsimons facility. One of the principal eligibility criteria that the military must consider when reviewing an EDC application is the extent of job generation. Job creation, after all, is the primary intent of this "jobs centered" property disposal authority.

Background and Approach

Since the Fitzsimons Redevelopment Authority (FRA) makes a persuasive case for its job creation projections, USACERL's analysis in this particular case was limited primarily to an independent validation of the calculation methodology and source data. The Fitzsimons EDC application clearly delineates both the manner in which calculations were made, and the underlying rationales for necessary assumptions. Because of this level of detail, and because a well-prepared Local Redevelopment Authority is frequently in better position to evaluate important local factors, USACERL's scope of review in this case was considerably more deferential than has been the case for other less complete EDC applications.

Irrespective of this deference, however, it is important to note that, although the forecasting procedures used by both the FRA and USACERL will generate sound estimates, the resulting projections are only as useful as the validity of the underlying assumptions. Major changes in key assumptions, especially changes

in the absorption schedules for existing and new gross square footage,* in the aggregate economic activities of the tenants, or a downturn in the bioscience industry, may lead to dramatic differences between the number of jobs actually created and these projections.

Process Methodology

Following the standard procedure for applying an input-output analysis, USACERL first conceptually divided the economic impacts of the Fitzsimons redevelopment into short- and long-term impacts. For purposes of this analysis, "short-term" refers primarily to impacts related to the redevelopment process itself, such as the jobs and economic effects created as a result of construction and maintenance activities. "Long-term" refers to the impacts related to the ongoing activities of firms that will be permanent or semi-permanent Fitzsimons tenants.

In this particular review, USACERL elected not to further consider short-term employment impacts. Although these impacts will undoubtedly be present over the 25-yr projected development schedule, these impacts were not considered for several reasons. First, USACERL's deferential scope of review suggested against development of independent short-term estimates. Moreover, the complications engendered by the lengthiness of the 25-yr redevelopment schedule would have rendered these projections highly speculative.

Long-term impacts, however, were independently evaluated to determine both the types of economic activity that might be involved, and the relative magnitude of each activity. By comparing these activities, and their volume, to similar activities already occurring in the local economy, USACERL was able to construct a series of multipliers describing the likely impact that any new (but similar) business activities would have on the local area, and to compare these multipliers with the EDC estimates. Since the elements of a regional economy are inherently interrelated, this approach offers an effective way of measuring the entire impact of a given event. For example, each permanent end-user will create a particular set of onsite jobs at the former Fitzsimons site. Since these employees will purchase goods and services in the surrounding community, these onsite jobs will also create additional offsite jobs located in the surrounding

* See Chapter 4, **Business Plan Review and Market and Financial Feasibility Analysis**, for more detail on these schedules.

economic area. A local economic multiplier will capture both the impact of onsite job creation (a direct effect) and the number of additional jobs created as a result of onsite jobs and economic activity (an indirect effect). Once these effects are calculated for each activity, they can be grouped together to find total employment impacts.

Extent of Long-term Job Creation

Although it is impossible to definitively project job creation that may occur over a 25-yr period, USACERL's analysis generally confirmed the direct job-creation estimates presented in the EDC application. In addition, USACERL used Implan Pro 1.1 to calculate employment multipliers in an attempt to forecast indirect and induced jobs created by the redevelopment of Fitzsimons.

Methodology

Specifically, USACERL generated long-term job creation estimates by implementing a three-step process. This process consists of: (1) considering the types of activities that are likely to take place during and after full redevelopment, (2) developing appropriate multipliers to capture the local impact of these activities, and (3) projecting likely cumulative total impacts. Although the FRA clearly identifies the types of land uses that will ultimately occupy the site, the exact type of end user will not be determined until occupancy occurs. Therefore, the calculation of these estimates is constrained by the absence of exact information regarding the volume of economic activity these tenants are likely to generate. In addition, although both the FRA and USACERL were able to generate similar gross employment estimates, these estimates varied somewhat due to differing assumptions regarding the employment densities of tenants likely to locate at the site. Hence, the inaccuracies inherent in this approach will likely result in a model that is less accurate than one based on actual gross revenue data.

Multiplier Calculation

USACERL extrapolated potential employment densities from typical industry standards present in the Denver PMSA. This factor is important in estimating gross economic activity, because employment projections are a function of both how fast the local market absorbs new space, as well as how intensively the new space is used.

Additionally, the employment density estimates presented in the EDC application varied from about 250 to 500 usable sq ft of space per employee, depending

on the type of land use (or space use in a bioscience building). USACERL evaluated these estimates by comparing them to industry norms for the area and found them reasonable. Nevertheless, USACERL based its calculations on alternative estimates of employment density as per the Urban Land Institute Business and Industrial Park Handbook. The densities used by USACERL and the FRA are listed in Table 2.1.

Although the FRA provided information about the types of end users that will ultimately occupy the redeveloped site, the EDC application failed to provide multiplier estimates, as well as other specific employer and revenue data. Accordingly, USACERL found it necessary to make some general assumptions about the future tenants with respect to these issues. For example, since one of the focuses of the FRA Reuse plan is the development of retail space, USACERL's analysis assumes that the activities of future retail tenants will be similar to those of other retail firms in the local area. Making this assumption allowed USACERL to aggregate similar retail industries in the area into a gross multiplier that generally describes the impact of other local retail firms. Similar aggregation operations were performed for other land uses.

After constructing these aggregations, USACERL found that typical employment multipliers for local retail activities are probably about 1.5. Similarly, employment multipliers for manufacturing uses were found to be about 2.5, and multipliers for office uses were about 1.7.

Table 2.1. USACERL long-term job-creation estimate.

Land-Use Type	Developed Square Feet	USACERL Employment Density	Onsite Jobs Created	USACERL Multiplier	Total Jobs Created
Bioscience	1,491,900	485	3,076	1.717	5,282
Manufacturing	67,891	543	125	2.562	320
Office	25,000	347	72	1.760	127
Commercial/Retail	89,990	197	457	1.573	719
Total	1,674,781		3,730		6,447

Long-term Employment Projections

After developing an idea of the economic volume that will take place after redevelopment, as well as the types of activities it will probably involve, USACERL developed a forecast for likely long-term job creation. Table 2.1 summarizes the long-term employment projections calculated as part of USACERL's independent analysis.

These figures vary somewhat from estimates cited in the EDC application for several reasons. Foremost, USACERL job creation estimates include only the impacts that are directly associated with the EDC parcel; the FRA is estimating the creation of an additional 14,000 jobs associated with the development of non-EDC parcels, including the UCHSC. In addition, although a similar calculation methodology was used regarding the use of employment densities, the FRA's failure to use employment multipliers resulted only in direct estimates, which do not capture important residual effects. In particular, estimates provided in the EDC application predict that roughly 3,731 jobs will be created from the redevelopment of the EDC parcel. These figures are comparable to the direct "onsite jobs created" figures that USACERL calculated. However, once multiplier effects are taken into consideration, USACERL estimates that roughly 6,447 jobs will result from the EDC at full build out.

Caveats

Since it was necessary to make a variety of assumptions in order to construct these estimates, several caveats are in order. Although USACERL has attempted to present conservative estimates that minimize the possibility of overstating job creation estimates where possible, potential problems can always arise when economic forecasts are based on such a large assumption set. The caveats used by USACERL in conducting its analysis are as follows:

- Analyses assume that the activities of future tenants will be functionally similar to those of similar firms in the local area.
- The modeling procedure used to construct these estimates (a standard input-output model) assumes that an underlying regional economy is static in nature, and cannot capture essential long-term structural changes. Thus, fundamental shifts in a local economy may render its projections inaccurate, especially with regard to indirect and induced projections.
- Although USACERL was able to generate gross estimates based on various assumptions,^{*} some inaccuracies are inherent in this approach that will likely result in a model less accurate than one based on actual gross revenue data.

* Examples would include the total number of people that future tenants at DPSC might employ and the type of tenants that will locate at DPSC.

- Major changes in the absorption schedules for existing and new gross square footage,* in the aggregate economic activities of the tenants, or a downturn in the economic cycle may lead to dramatic differences between the number of jobs actually created and these projections.
- No attempt was made to adjust for inflationary effects, because the lack of data about future gross output precluded USACERL from developing an acceptable method of adjusting long-term estimates. Errors caused by this omission will likely not be of significance.

Reconciliation of Job Creation Projections and Closure Impacts

As the final step of the analysis, USACERL compared the various employment generation forecasts to the economic impacts of the Fitzsimons closure (see Chapter 1, **Adverse Economic Impact of the Closure on the Region and the Potential for Recovery After the EDC**). This final analytical step is intended to offer an idea of when total closure impacts might reasonably be mitigated. Thus, it is significant to note that the total number of jobs eventually created from the EDC alone fully mitigates the projected impacts that will likely result from the 1995 BRAC decision. However, this estimate does not include the roughly 14,000 jobs that will potentially result from the various PBCs.[†] Once job creation estimates resulting from PBC and EDC parcels are aggregated, USACERL's analysis indicates that the realization of a large, positive net gain in employment for the region will likely be realized.

Conclusion

USACERL's analysis of potential long-term job creation suggests that about 3,370 direct and 6,447 total jobs will eventually be created as a result of the EDC. While the direct estimate presented in the EDC application of 3,731 jobs is slightly different, USACERL's review suggests that this direct estimate was generated in a methodologically sound manner.

* See Chapter 4, **Business Plan Review and Market and Financial Feasibility Analysis**, for more detail on these schedules.

[†] The PBCs are primarily related to the development of the University of Colorado Health Sciences Center, which is already in progress.

Overall, the major discrepancy between the FRA's estimate and USACERL's estimate resulted from the FRA's failure to consider multiplier effects, which resulted in an understatement of total job creation. Nevertheless, the total number of jobs that will eventually be created from the EDC alone fully mitigates the projected impacts that will likely result from the 1995 BRAC decision.

3 EDC Application's Consistency With the Overall Redevelopment Plan

Prepared by:

Jonathan D. Trucano, Community Planner
USACERL, ATTN: CECER-PL-N
P. O. Box 9005
Champaign, IL 61826-9005
(217) 352-6511 x6307

Background

The objective of this chapter of the review is to determine whether the redevelopment implementation strategy proposed in the Fitzsimons Redevelopment Authority's (FRA's) EDC Application and Business Plan is consistent with the adopted Fitzsimons Redevelopment Plan. The Redevelopment Plan was prepared for the FRA by BRW, Inc., and approved in January 1997.

It must be noted that the adopted Fitzsimons Redevelopment Plan is inclusive of the entire Fitzsimons site; in contrast, the EDC application does not include those parcels slated for conveyance through other property transfer authorities, namely PBCs. Of the 577-acre Fitzsimons site, the EDC parcel constitutes only 332.3 acres.

Conclusions

After reviewing the FRA EDC Application and adopted Redevelopment Plan, USACERL finds that the Application, in conjunction with other planned PBCs, is generally consistent with the goals, objectives, and implementation strategies set forth in the Redevelopment Plan. It is important to recognize the synergistic relationship between the types of development planned for the EDC parcel and neighboring PBC parcels, primarily the medical campus for the University of Colorado Health Sciences Center (UCHSC). USACERL used the following criteria when reviewing the EDC Application and Redevelopment Plan for consistency.

The application, in conjunction with plans for ancillary PBCs, captures the spirit and intent of the Redevelopment Plan by meeting the following stated goals and objectives:

- The proposed reuse of the Fitzsimons site will attract new development that takes advantage of the medical, research, location, and infrastructure assets of Fitzsimons.
- The proposed reuse will create a stimulus for new investment in North Aurora, with an early emphasis on redevelopment opportunities for properties within the Project Area adjacent to Fitzsimons, and that is compatible with the surrounding residential neighborhoods.
- The proposed reuse will strengthen the tax base of the community through the attraction of significant private businesses.
- The proposed reuse will retain and incorporate the historic and campus environment with new development.
- The proposed reuse will provide for community needs such as parks, recreation, cultural/arts programs, housing, health care programs, education, and city government functions.
- The proposed reuse will consider program proposals from homeless service providers for possible inclusion in the overall redevelopment plan.

The application does not adequately address the following goals and objectives articulated in the Redevelopment Plan, but does not conflict with their implementation:

- The proposed reuse of the Fitzsimons site will provide for linkages to adjacent open space and planned trail systems.
- The proposed reuse will develop land-use patterns that encourage increased uses of public transit and alternative modes of transportation.
- The proposed reuse will incorporate urban design standards, landscaping, and a high-quality overall image in the development plan.

The application is consistent with the Redevelopment Plan's marketing strategy and implementation plan as follows:

- It places a strong focus on targeting bioscience firms as the key components of development in the EDC parcel. However, the Application does not elaborate on the exact marketing strategies to be used for firm recruitment, and relies almost exclusively on UCHSC to provide tenant firms for the proposed research park.
- It attempts to target small firm start-ups in the early phases of redevelopment by creating 60,000 sq ft of incubator space, and adding additional multi- and single-tenant space in future phases to accommodate the growth of start-up firms and to attract larger firms who are more footloose. This strategy recognizes the volatility of newly forming firms, particularly in the bioscience industry, and provides a variety of real estate options. These options are designed with flexibility in mind, offering ground leases for incubator and multi-tenant facilities and sales of single-tenant parcels to individual firms, so that they may build to suit their particular needs.
- It reflects a spirit of cooperation between the FRA, the City of Aurora, and UCHSC, particularly in terms of infrastructure phasing and management. These costs have been spread over the project life to provide necessary services to the medical campus and to the separate phases of the EDC parcel, in order to accommodate a systematic pattern of growth. In addition, UCHSC has expressed a willingness to encourage the types of spin-off development that will promote the viability of the bioscience research facilities planned under the EDC.

4 Business Plan Review and Market and Financial Feasibility Analysis

Prepared By:

Jeffrey J. Bogg, Community Planner
USACERL, ATTN: CECER-PL-N
P.O. Box 9005
Champaign, IL 61826-9005
(217) 373-6752

Objective

The objective of this chapter is to provide a review and analysis of the financial feasibility of the Fitzsimons Army Medical Center EDC application and its business and operations plan. USACERL's technical review of financial feasibility includes market analysis and the need and extent of proposed infrastructure investment (**Chapter 5, Need and Extent of Proposed Infrastructure Improvements**). Elements of importance in the review of the Business plan include (DoD 1997):

- a property development timetable, phasing plan, and cash flow analysis
- a market and financial feasibility analysis describing the economic viability of the project including:
 - an estimate of net proceeds over the projected development period
 - the proposed consideration and payment schedule to DoD
 - the estimated fair market value
- a cost estimate and justification for infrastructure and other investments needed for the development of the EDC parcel (**Chapter 5, Need and Extent of Proposed Infrastructure Improvements**)
- local investment and proposed financing strategies for the development (also covered in **Chapter 6, Extent of State and Local Investment and Risk**).

Background

The Fitzsimons Redevelopment Authority (FRA) is requesting an EDC to acquire approximately 332.3 acres of the 578-acre Fitzsimons Army Medical Center, Colorado, along with water, wastewater, storm water, gas and street utility systems for a proposed consideration to the Department of the Army of \$1,000,000 (FRA 1998, p 51). The EDC parcel contains approximately 119 existing buildings representing over 1.4 million sq ft of total floor space. The remaining building inventory has been claimed by the University of Colorado Health Sciences Center (UCHSC) and the City of Aurora under the public benefit conveyance authority or will be retained by the Department of the Army. Of the 1.4 million sq ft of existing building space contained within the EDC parcel, roughly 0.5 million sq ft has been programmed for demolition by the FRA.

According to the January 1997 Reuse plan, the preferred reuse alternative: "...develops Fitzsimons as an integrated health sciences university campus with an associated bioscience park. It reflects the vision of the UCHSC administration for Fitzsimons to become its main campus over a period of time and was developed jointly with the university's planning team. In the short run, the site would act as a branch campus accommodating a range of administrative, research, educational, and clinical uses. Over a 25 to 30 year time period, Fitzsimons would become the main campus including the major medical schools and inpatient and outpatient medical facilities. UCHSC will have significant research uses and facilities onsite in the short run that will "feed" the bioscience park. UCHSC will be actively involved in the management and operations of the park. Supportable housing, community, and cultural uses would be developed on the land on the periphery of the main campus" (Fitzsimons Reuse Plan, 1997, pp 5-7).

To accommodate job creation and economic development goals, the Reuse plan has identified four major EDC future uses including bioscience park, mixed use, office/light industrial, and industrial programmed over four project phases. See Figure 3 in the **Introduction** for the Fitzsimons Land Use Plan. Table 4.1 summarizes the FRA's land-use mix.

Table 4.1. Proposed EDC land uses and existing acreage.

Proposed Land Use	Acres
Bioscience Park	147.0
Business/Industrial/Lab	23.0
Commercial	10.7
Service	2.7
Medium Density Residential	51.8
Open Space/Recreation/Other	67.0
Right of Way (ROW)	30.0
Total	332.3

Approach

The approach to the technical review included a review of the entire EDC application package, supporting documents, and reports. USACERL also conducted interviews with the Fitzsimons Caretaker Force personnel; U.S. Army Corps of Engineers (USACE), Omaha District, action officers who are currently handling the real estate disposal of Fitzsimons; and local economic development officials (USACERL site visit to Fitzsimons, CO, 25-27 February 1998). With necessary site data collection complete, USACERL was than able to perform market and financial feasibility analysis through the development of spreadsheet-based models, pro formas, and tables. In general, the enclosed spreadsheets are organized in two principle groups: (1) a recast of the FRA business plan assumptions and discounted cash flow results and (2) USACERL-developed data tables, analyses, and findings of financial feasibility. After a general discussion of these two sets of analyses, USACERL will present its findings.

Recast of FRA Business and Operations Plan scenario. To aid in the analysis and documentation of the financial feasibility of the FRA business and operations plan, USACERL recast the applicant's assumptions into computer spreadsheet-based pro formas, models, and tables. This accomplished two objectives: (1) to check the applicant's mathematical calculations, methodology, and proper application of discounted cash flow methodology and (2) to give USACERL analysts an opportunity to fully understand the assumptions that support the applicant's cost and revenue projections. Once reconciled and understood, this recast serves as a baseline model for developing and testing alternative business plan scenarios. A listing and description of the tables supporting the FRA business plan recast follow.

Tables B.1 through B.6, which are contained in Appendix B, relate the baseline set of assumptions used by USACERL to evaluate the financial feasibility of the FRA business plan. A description of each of these tables follows. Relevant technical findings will be discussed in further detail in the **Business Plan Review and Findings** section.

Table B.1, Projected 25-Year Absorption and Revenues, contains total revenue and absorption projections for Bioscience park land (sales and ground lease), reusable buildings, and interim use buildings.

Table B.2, Bioscience Incubator Pro Forma, contains 23-yr revenue and cost projections for the FRA's 60,000 sq ft bioscience incubator.

Table B.3, Multi-Tenant Pro Forma, provides a 10-yr market and financial feasibility analysis to support FRA recommended ground lease rates in Table B.1.

Table B.4, Golf Course Pro Forma, projects 18-yr revenues, direct expenses, interfund charges, net cash flow, and net present value for the Fitzsimons golf course.

Table B.5, Infrastructure Costs and Operating Expenses, details the FRA's estimated infrastructure costs by year and system. Also, first year operating expenses, including salaries and wages are included. All cost assumptions are inflated by 3% beginning in Year 2, or 1999 of the pro forma.

Table B.6, Fitzsimons Business Plan Summary, projects 25-yr revenues, development costs, and operations and maintenance costs, in addition to providing project net present value (NPV) calculations at 15 and 11% discount rates.

With these baseline analyses, USACERL developed an alternative scenario to test the sensitivity of key assumptions and demonstrate the impact on the discounted NPV of the cash flows after making defensible changes to assumptions.

USACERL scenario development. USACERL developed the alternative scenario to test the sensitivity of certain key assumptions proposed in the FRA business plan. USACERL also challenged several assumptions based on review findings and documented the impact of these changes to project cash flows and the NPV of the business plan. The tables that document these findings are briefly discussed in this section. However, the analysis and findings that lead to the development of the alternative scenario are discussed in detail in **Business Plan Review and Findings**.

Table B.7, CERL1 Infrastructure Costs, provides USACERL's independently estimated 25-yr redevelopment costs.

Table B.8, CERL1 Summary Cash Flow, projects 25-yr revenues, development costs, and operations and maintenance costs in addition to NPV calculations at 15 and 11% discount rates under CERL1 Scenario assumptions.

Table B.9, Scenario and Sensitivity Analysis, summarizes the impacts to revenues, operating costs, infrastructure costs, and total cash flows, in addition to Year-25 property reversion calculations and NPVs at 15 and 11% discount rates. The table also provides one project view that is applied to CERL1

assumptions: (1) reduced Bioscience park absorption, and (2) reduced need and extent of infrastructure improvements.

Business Plan Review and Findings

Introduction

According to the FRA, the proposed EDC and supporting business plan is consistent with the dictates of the reuse plan completed in January 1997. Specifically, the Reuse Plan contemplates a bioscience redevelopment scenario for the EDC parcel programmed over four distinct phases that operationally and economically leverage the onsite presence of UCHSC.* More importantly, from a project implementation standpoint, the proposed EDC allows the FRA to gain total ownership and control of the site in a more expeditious manner than could otherwise be accomplished under other Federal transfer authorities (FRA, pp 48-49).

The FRA further asserts that a \$31.4 million infrastructure investment is required to bring buildings within compliance of modern codes, improve access, create needed sewer and water capacity, allowing for the development of quality Bioscience park sites. It is the conclusion of the applicant, as developed through financial pro forma analysis, that the Reuse Plan would not be financially feasible without the significant participation proposed by the Fitzsimons Redevelopment Authority. Finally, the FRA states that the proposed EDC benefits both the Army and the FRA in that it allows the FRA to play an active role in Fitzsimons reuse, recovering early costs through long-term cash flows, and providing the Army with a cash payment for the property transfer. The following report section is dedicated to the review and analysis of the FRA's business plan, which is the instrument through which financial feasibility and potential monetary consideration to the Army is developed.

Description of Intended Uses

An important first step in developing the reuse and business plan is to inventory land and existing facilities at Fitzsimons that could be offered to the private

* The term "bioscience" describes the industries and institutions that are often associated with both biotechnology and biomedical fields. Specifically, "the bioscience industry is defined to include institutions and companies involved in the research, manufacturing and/or distribution of biological pharmaceuticals, medical devices, biotech-related agricultural or environmental remediation products, and the suppliers to these companies and institutions" (EPS 1996, p 2).

sector for reuse and redevelopment. The intended purpose of this analysis was to develop a reasonable estimate of total land area that could potentially be marketed for sale, the number of marketable permanent-use buildings on the site, the amount of acreage that would be needed to support these uses, and the remaining acreage that is being transferred through public benefit conveyances or will remain under Government ownership.

Land. The Reuse Plan for Fitzsimons identifies a limited range of intended uses for the surplus parcel, primarily including Bioscience park space, but also offering some retail, service, and medium density housing along with provisions for open space and recreation. USACERL's reconciliation of the FRA's intended uses and eligible EDC acreage resulted in the following land use mix: 147 acres of bioscience park; 23 acres for Business/Industrial/Laboratory uses; 10.7 acres of commercial; 2.7 acres of service; 51.8 acres of medium-density residential; 67 acres of open space/recreation/other; and roughly 30 acres of site right-of-way (ROW).^{*} This land use composition results in a total of over 332 acres relative to the entire 578-acre Fitzsimons site. As briefly discussed earlier in this report, a large portion of developable acreage will be transferred via an educational public benefit conveyance (194.6 acres) for use as UCHSC's new medical campus. An additional 30.1 acres of Fitzsimons are scheduled to be transferred through public benefit conveyances to the City of Aurora for educational, training, and recreational uses. The final 21.3 acres are tentatively planned to be retained by the U.S. Army for a Reserve Enclave.

Buildings. Fitzsimons has a variety of buildings of varying architectural and construction styles. In total, over 72% of all the site buildings were constructed before 1950; however, seven buildings were constructed in the 1990s, including a replacement Central Energy Plant Complex. Type of construction varies with facility use and year of construction, but some generalizations can be made: nearly 50% of site buildings are constructed with concrete, slag, or concrete block; 28.1% are constructed with structural tile; and the balance represents a mix of brick, clay, metal, and wood structures. USACERL estimates that nearly 119 buildings are contained in the EDC parcel for a total inventory of over 1.5 million sq ft. Nearly 0.5 million sq ft of the EDC space is comprised of medium-density housing, with the balance representing warehousing, utilities, administrative, and specialized uses.

* Note that the FRA did not present a cogent summary EDC acreage by proposed land use. The figures presented in this report represent USACERL's best effort, and any potential errors should not substantively impact overall business plan results due to the nature of projected revenues and costs.

Several buildings are of particular importance for the FRA in terms of revenue-generating potential including:

- *Building 628, Optical Fabrication Lab*, contains nearly 26,000 sq ft of potential light industrial and/or laboratory space, and features significant upgrades to the mechanical and electrical systems.
- *Building 290, Central Heating Plant*, contains 27,500 sq ft of new office space in addition to 38,400 sq ft of vacant general use space.
- *Building 288* is a new maintenance building that features separate carpentry, sheet metal, machine, welding, vehicle maintenance, plumbing, and electrical shops.
- *Building 289* is a 14,700 sq ft general-purpose warehouse with high- and low-loading docks.
- *Building 262* is a new 12,200 sq ft administrative building with a variety of office configurations, conference rooms, and large open areas.
- *Building 816* is a 2,695 sq ft Burger King fast-food restaurant.
- *Building 642* is the 14,395 sq ft Fitzsimons Community Club.
- *Series 700 and 800 housing* are family housing units constructed in the 1950s and 1960s.

In total, the FRA contemplates the reuse of 698,375 sq ft of existing space for revenue-generating uses, with the remainder programmed for demolition over 25 years. However, it is worthy to note that over 98,600 sq ft will only be retained on an interim basis, and will be demolished within the first 10 years of the business plan for a total 25-yr demolition program of 0.5 million sq ft (38%).

Market Analysis

Once a development strategy has been formulated based on a bottoms-up assessment of existing facilities and economic development objectives, a market analysis is performed to estimate the potential marketability of land and buildings based on real estate market demand and supply drivers. In this case, income projections for bioscience park, commercial, business/industrial/laboratory, service, and residential space are based on market research conducted on behalf of the FRA by Economic and Planning Systems and Bay Area Economics.

The market findings developed for the FRA serve as the basis for developing annual property absorption and revenue projections from the sale and lease of land and existing buildings. In general, USACERL found the FRA's market analysis treatment to be well reasoned and technically defensible with few exceptions.

Bioscience park. Because the bioscience park represents the largest component of the FRA's reuse strategy, considerable effort was dedicated to related market potentials. According to the FRA, the onsite presence of the UCHSC provides Fitzsimons with a market advantage "that distinguishes it from other developments competing for the bioscience market," fostering a synergy from adjacency to and partnership with the UCHSC (FRA 1998, p 6). Accordingly, the FRA argues that primary demand for EDC bioscience park land and facilities will be generated by spin-off activity from UCHSC and to a lesser extent the Denver metropolitan region. Alternatively, the large supply of industrial and office space at nearby Lowry Air Force Base, Stapleton, and the Gateway area near the new DIA puts Fitzsimons at a competitive disadvantage in these markets (see Figure 2 in the **Introduction**).

The redevelopment of Fitzsimons complements the overall growth of the bioscience industry at the national level and for the State of Colorado. Studies conducted in conjunction with the Fitzsimons reuse planning process suggest that Colorado is now home to 20 to 30 bioscience firms and 277 medical device manufacturers, representing 2 and 3% of the national total, respectively. According to the FRA, "this level represents the beginnings of a critical mass of bioscience firms in the state" (FRA 1998, Appendix E, p 2).

As stated, the FRA's ability to attract bioscience activity rests largely with the speed at which UCHSC's relocation to Fitzsimons occurs and how economic linkages are established and maintained. To that end, the EDC application notes that links between UCHSC and the FRA will be established in the following manner:

- partnership with the University
- consultation with the faculty
- access to specialized University equipment and facilities
- adjunct professorships for key researchers
- continuing education for key researchers

- continuing education for employees
- recruitment of graduate students and recent graduates.

Because of this potential synergy arising from complementary academic and economic activities, the FRA believes that Fitzsimons will command a unique marketing niche that will allow the bioscience park to effectively compete in this market segment. Similarly, such a market specialization carries with it a degree of risk because of the reliance on one type of tenancy, which limits overall market exposure to non-bioscience firms that may wish to locate at Fitzsimons. In addition, the emphasis on specialized wet laboratory space required by bio-science park users limits building reuse opportunity without additional renovations and further increases operational and market risk.

Research park development is a slow process focused primarily on creating jobs and on economic development rather than on traditional real estate development profit objectives. Accordingly, the FRA asserts that the pace for such developments is often slow, with annual property absorption ranging from 5,500 to 93,000 sq ft. The high end of the range represents activity at the Massachusetts Biotechnology Research Park, which lies within a region with seven times the biotechnology and medical device manufacturing activity that Colorado has. The low end of the absorption range represents Hopkins Bayview Research Campus, which may be experiencing difficulties attracting tenants due to the economically depressed neighborhood in which it is located.

According to the FRA, one of the keys to bioscience success is the speculative development of facilities. Financing available to early stage bioscience firms is scarce and almost exclusively dedicated to basic research and development as opposed to real estate. Also, rapid advances in product development often require a company to expand without lead time to appropriately plan for the construction of a new facility. Accordingly, the bioscience industry relies on the real estate development community to provide facilities in early stage development rather than investing in build-to-suit facilities. As companies expand to full-scale product manufacturing, real estate requirements again change. At this stage companies are mature enough to acquire or build production facilities in much the same manner as traditional light industrial companies, with the same low cost objectives in mind.

The initial land purchase and infrastructure funding for research parks tends to be financed through a series of land contributions, infrastructure grants, and low-interest loans. The naturally slow pace of bioscience development limits the parks' ability to finance the early infrastructure costs from land sales revenues.

Given the proposed scale of clinical and research activity at UCHSC, the national appeal of the Denver metro location, the size of the Colorado biotech and medical devices market, and the nature of the Fitzsimons offering, the FRA anticipates average annual demand for 25,000 to 35,000 sq ft of space with smaller tenants (3,000 to 20,000 sq ft) seeking space in multi-tenant buildings. The level of demand over 25 yr is expected to generate the need for 11 60,000- to 80,000-sq-ft facilities within the bioscience park. The typical bioscience tenant will require roughly 60% of its space to be designed for wet labs and 40% for office space. In addition, the FRA believes the bioscience park should be able to attract one larger tenant of 100,000 sq ft for build-to-suit space on average every 3 to 4 yr, resulting in the ultimate construction of seven such facilities.

In terms of bioscience park real estate pricing, nearby competitive sites such as the Gateway Business Park suggest that land prices be set at \$8 per building sq ft, increasing to \$10 per building sq ft once the park is well established. Ground lease rates for bioscience land will initially be set at \$0.72 per building sq ft and will escalate to \$0.90 per sq ft as the park gains an identity and matures from a real estate perspective. Rents for office or dry lab space must be competitive with other space available in the market, suggesting that triple net (NNN) rents should run between \$9 to \$13/sq ft for new Class A space and between \$3 to \$5/sq ft for existing Class B space. Interior improvements such as wet lab space can add between \$60 and \$100/sq ft to the cost of building construction. Accordingly, costs could be recovered through the amortization of improvements in lease rates, suggesting supportable rents of between \$20 and \$22/sq ft depending on the extent of wet lab improvements. Given these pricing levels, and anticipated demand for EDC properties, the FRA anticipates full build-out of the bioscience park within 25 years (Year 2022).

USACERL bioscience findings. In general, USACERL supports the bioscience market findings proffered in the EDC application business plan. To assist in the independent validation of real estate market findings, USACERL relied on key informant interviews with sources familiar with the bioscience industry or the Fitzsimons redevelopment project specifically, and on third-party real estate reports and studies. In general, USACERL's review of bioscience market feasibility is segmented into four market-driver groups: (1) UCHSC, (2) State of Colorado, (3) industry trends, and (4) bioscience incubator.

UCHSC. USACERL generally supports the FRA's market conclusion that UCHSC will be the primary catalyst for demand of EDC space. Accordingly, USACERL attempted to answer three questions concerning UCHSC's role in the redevelopment of Fitzsimons: (1) what is the speed at which the relocation to Fitzsimons will occur, (2) what is the anticipated level of UCHSC investment in

the site, and (3) how does UCHSC plan to establish academic and economic synergies with the FRA and its bioscience park offering. To accomplish this task, Bill Crawford, Assistant Vice Chancellor for UCHSC, was interviewed.

Speaking on behalf of the University of Colorado Board of Regents and the Health Science Center, Mr. Crawford related UCHSC's vision for the 194.6 acres of Fitzsimons requested under an education PBC and its relationship with the FRA. Currently, UCHSC is located in 3.0 million sq ft of space at a 47-acre site in an urbanized area of Denver. According to Mr. Crawford, the site represents a constraint to future program development due to the burgeoning requirement for land and facilities to support UCHSC's exploding clinical and academic programs. The University of Colorado is the largest research institution in Colorado, with UCHSC one of the largest recipients of sponsored research funding. For example, UCHSC received 45% of the \$300 million in University of Colorado-sponsored research in 1996; this figure is expected to grow commensurately with the medical and bioscience industries.

In terms of the relocation and build-out plan, UCHSC envisions a 20- to 30-yr schedule, culminating in the eventual occupation of roughly 5.0 million sq ft of research, academic, and office facilities. In the near term, UCHSC has identified 40 to 50 buildings for reuse, including the 450,000 sq ft Building 500 that is scheduled for over \$19 million in renovations over the next 2 yr. According to current UCHSC relocation projections, over 0.8 million sq ft of building space should be occupied by the year 2000, which coincides with the third year of the FRA Business Plan. Finally, total relocation investment over the 20- to 30-yr planning horizon, which includes the move, expansion activities, and equipment, is anticipated to total \$2 billion.

Based on the interview conducted with Mr. Crawford, it is the opinion of USACERL that UCHSC is fully committed to the Fitzsimons site. UCHSC has been working closely with the FRA on site utility issues through a utility working group. In addition, UCHSC has pledged to create a synergistic relationship with the FRA in terms of specialized equipment and facility sharing, access and consultation with researchers and faculty, adjunct professorships, continuing education for bioscience park employees, and recruitment of students and recent graduates. Ron Kysiak from the Association of University-Related Research Parks (AAURP) states that, "(t)he greater the involvement of the university, the stronger the chance of the park's success." It is precisely these types of relationships that will be developed at Fitzsimons, which will add value to the process and result in technology transfer from UCHSC to the bioscience park.

Also, UCHSC enjoys widespread political support as evidenced by the Board of Regents recent establishment of a \$100 million trust fund to support UCHSC research activities, funding from Congress for a Native American health research center, and support from the State of Colorado legislature. Additionally, UCHSC is a member of the FRA Board.

State of Colorado. To better validate overall bioscience activity within the State of Colorado and the role of Fitzsimons within this emerging industry, USACERL conducted key informant interviews with Jeffrey Nathanson, Executive Director of the Colorado Bio/Medical Venture Center, and Dr. Charles Ferris, Director of Bioscience Programs at the Colorado Advanced Technology Institute (CATI). The Colorado legislature created CATI under the Colorado Commission for Higher Education to foster collaborative university-industry education and biotechnology research. The State of Colorado generally views the bioscience industry as one of its five industry clusters of the future.*

According to Mr. Nathanson and Dr. Ferris, Colorado's bioscience industry, composed of biotechnology, medical devices, diagnostics, and pharmaceutical sectors is a strong and emerging industry. The industry is concentrated in the Front Range of the Rocky Mountains, stretching from Fort Collins in the north to Colorado Springs in the south (see Figure 1 in the **Introduction**). The emergence of the bioscience industry in Colorado is a result of the following factors:

- a well-established medical device industry
- an emerging molecular and cellular biotechnology industry
- the presence of a world-class research community
- a strong industry network facilitating collaborations
- a good supply of venture capital, labor, and lab space
- a pro-business environment.

* According to Mr. Nathanson and Dr. Ferris, the other four industries include, generally: information technology; food and spirits; printing and publishing; and transportation.

A survey conducted for CATI in 1994 indicated that Colorado's biological science and technology industry consisted of approximately 286 companies employing nearly 18,000 people and representing \$4.3 billion in output. Approximately 70% of the companies in the state are involved in the design and manufacture of medical devices, including diagnostics, therapeutics, electronics, and information technologies related to the biotechnology sector. The remaining 30% were working in the areas of molecular and cellular biology and pharmaceuticals. However, molecular and cellular biology are expected to be the future of biotechnology and are poised to grow with the industry as a whole. This is clearly manifested by the recent location of major operations in Colorado by Amgen. Amgen broke ground in October 1996 on a \$200 million pharmaceutical manufacturing center located on 72 acres in Longmont. During the third quarter of 1997, Amgen purchased an additional 162 acres. This move appears to suggest that Amgen is planning to increase business activities in Colorado. This increase in activity is said to be the result of long-term relationships with the University of Colorado research in the areas of bioscience. Other emerging Colorado companies with close university ties include Ribozyme Pharmaceuticals Incorporated, NeXstar, Heska, Somatogen, and two new genomic companies Genomica and Genoplex.

Spatially, the industry is clustered primarily in Boulder County, which is home to 66 (23%) of Colorado's bioscience companies and nearly 6,000 employees. One manufacturer in Littleton commented in a study that, "(t)he whole of Boulder County is like a Bio-Med incubator. There are fewer opportunities [for exchanges] if you are not located here." Mr. Nathanson and Dr. Ferris echoed these sentiments, but also asserted that by and large the industry is fragmented geographically within the state. Fitzsimons is viewed by the state as potentially providing a central point of focus for the industry, or "address," which the state cannot currently boast. In addition, although a strong synergistic relationship clearly exists between Colorado's universities and bioscience sector, only Fitzsimons will offer direct onsite access between university facilities and staff and bioscience park companies. Mr. Nathanson and Dr. Ferris generally view this factor as being critical to the future success of the site. Finally, because of Boulder County's success and growth, supply of facilities and land is becoming constrained. Coupled with this trend is the imposition of municipal urban growth boundaries (e.g., City of Boulder), which further constrain available space and development potential, thus increasing real estate costs. At some point, space will become prohibitively costly, forcing start-up and small bioscience concerns to seek lower cost areas.

With respect to UCHSC, the state views it as a highly regarded center for life sciences education and research. UCHSC is anchored by one of the foremost

public medical colleges in the nation that also conducts high-profile sponsored research ranging from \$135 to \$148 million annually. Core areas of research include dermatology, oncology, neuroscience, immunology, endocrinology, infectious diseases, and molecular biology. In terms of technology transfer, 12 start-up companies have formed in the past few years, including Mycotox and Ceres. Mr. Nathanson and Dr. Ferris believe that UCHSC will continue to expand its research success at Fitzsimons, resulting in technology transfer and spin-off activities in the bioscience park.

One of the potential limiting factors to overall growth and development of the Colorado bioscience industry is qualified labor. Many state companies have indicated difficulty in terms of recruiting technical expertise, although this is not a pattern unique to Colorado, and it generally does not reflect a negative perception of the state from a quality-of-life standpoint. The labor pool is considered highly educated, as evidenced by its third place ranking among states for adults with college degrees. Nevertheless, most companies recruit management and scientific personnel both locally and nationally. For laboratory technicians with bachelor's degrees, most companies generally recruit at the local level, thus supporting the contention that Colorado's universities are appropriately focused and are providing a technically competent workforce.

Another potential limiting factor for the success of the Fitzsimons Bioscience Park is competitive supply of facilities and land. Although the EDC application states that available real estate products at Lowry, Stapleton, and Gateway will not directly compete with bioscience uses at Fitzsimons, there is cause for concern over competitive pricing and similar-type developments. For example, one of CATI's current projects is the HEAT Center at Lowry, which is blocks from Fitzsimons. According to Dr. Ferris, the HEAT Center has positioned itself to capture bioscience, opti-electronics, and media users through education and training in these program areas. It is still unclear what the market impact on Fitzsimons may be from such competitive pressures, but it is clear that the FRA will be competing on the state level for bioscience companies and must focus its marketing strategy accordingly.

The final concern raised by Mr. Nathanson and Dr. Ferris was related to the financing of the state's bioscience industry. Unlike the major bioscience clusters located in Massachusetts and San Francisco, which are marked by large infusions of venture capital, the Colorado bioscience industry suffers from heavy competition with other sectors that effectively compete for venture dollars. Because of the risky nature of the bioscience industry, typical sources of business financing are often unavailable, compelling start-up and established companies alike to search for less risk-averse investors such as venture capitalists. The

Colorado venture capital community is currently cautious with respect to the bioscience industry due to the perceived volatility of the industry, a general lack of knowledge, and less risky returns from other industries. However, it is the contention of Mr. Nathanson and Dr. Ferris that the Colorado bioscience industry is reaching a "critical mass," which is coupled with several recent well-publicized success stories (e.g., Viagra) that should serve to generate interest and investment in the industry.

Industry trends. The FRA, UCHSC, and CATI have all indicated that the bioscience industry is volatile and is generally correlated with national economic and demographic trends. To better assess the general viability of the industry, USACERL evaluated the *Biotech 97: Alignment* report published by Ernst & Young (E&Y 1997). In general, the bioscience industry has been characterized by a 16% increase in sales growth for the existing product base, and the introduction of a significant number of new products. Coupled with sales growth, national employment in the industry rose by 9%, to a new high of 118,000, although the number of bioscience companies actually decreased as a result of industry consolidation. Approximately 30 new products received regulatory approval for U.S. markets, which industry analysts attribute, in part, to the Food and Drug Administration's (FDA's) successful attempts to streamline the approval process. For example, in 1995, FDA review times averaged 19.2 months compared with 34 months 10 years earlier.

The capital markets responded favorably to the bioscience industry's successes by increasing the market value from \$47 billion to \$77 billion for the industry's 294 publicly traded companies. At the same time, there were 60 new initial public offerings (IPOs) raising \$1.7 billion, \$707 million raised for venture financings, and \$3.4 billion raised for follow-on stock offerings.

It was unclear from the report how Colorado's industry has benefited from these positive national trends. However, it does appear that Colorado is becoming better positioned to capture a larger share of this growing industry based on the state's inherent intellectual, research, and economic strengths. For example, Mr. Nathanson and Dr. Ferris indicated that the state's bioscience industry was developing a core research competency in genomics. Genomics includes an array of tools and capabilities including gene therapy, combinatorial chemistry, high-throughput sequencing, high throughput screening, and bioinformatics. These tools are being applied to discover genes, unravel gene makeup, and draw practical connections between genes, the proteins they code for, and the diseases they cause, suggesting an almost unlimited potential for new drug treatments. The largest of the 60 IPOs issued during the study period were for genomics companies. UCHSC features a world-class molecular biology research

component which, in part, provides the basic research for genomics. In addition, the largest national market performers by research focus are cardiovascular, neurobiology, cancer, viral, and HIV/AIDS, which correspond to UCHSC's core research positioning in oncology, neuroscience, immunology, and infectious diseases.*

Therefore, it is the conclusion of USACERL that, to the extent that UCHSC maintains a relevant research focus in relation to overall market trends, its sponsored research programs will continue to expand. This growth represents real economic opportunities for the FRA's bioscience park in that UCHSC will likely "tech transfer" new bioscience technologies for commercial applications. The FRA offering positions the bioscience park to capture these commercial application developments through reasonable real estate pricing, the physical presence of UCHSC on site, and operational synergies between UCHSC and the FRA.

Business incubator. The FRA has proposed the construction of a 60,000 sq ft bioscience business incubator building as the first multi-tenant structure in the bioscience park. The building will likely include 50,000 sq ft for individual tenant suites and 10,000 sq ft for FRA offices, tenant support services, and shared facilities such as conference rooms, library, copier room, etc. The project cost is estimated at \$8 million. Funding is proposed to be provided through a \$6 million grant from the U.S. Economic Development Administration (EDA), a \$0.5 million grant from the U.S. Department of Housing and Urban Development, and \$1.5 million in local investment to cover the balance. It is worth noting that the EDA grant had not been approved by the EDA at the time of this writing.

Table B2 provides a 23-yr business plan pro forma for the operation of the EDA incubator. It assumes a 12-mo lease-up at an average rent of \$18/sq ft. Rental rates are assumed to escalate 6% every 4 yr and result in a rental rate of \$27/sq ft by Year 23 (2022). According to the FRA, the realization of these rents depends in part on the provision of basic shared scientific and support equipment. Operating expenses of \$3.50/sq ft are assumed to be passed through to the tenants, as are taxes and property management fees. In terms of financing, a \$1.15 million first mortgage loan is assumed, with a 5-yr deferral period on debt

* For example, UCHSC's Infectious Disease Department conducts extensive basic research and clinical HIV research and directs the AIDS Clinical Trial Unit.

service. Cumulative 23-yr cash flow is *positive* \$19 million with no annual negative cash flows, thus suggesting a financially viable business entity.

USACERL findings. Although the EDA typically awards grant funding to communities affected by BRAC, the level and use of the potential funding at Fitzsimons is relatively unique. The Urban Land Institute *Research Parks and Facilities InfoPacket* clearly suggests that successful research parks are usually marked by an incubator of some sort to spur development (ULI 1997). In general, business incubation is a dynamic process of business enterprise development. According to the National Business Incubator Association (NBIA), "incubators nurture young firms, helping them to survive and grow during the start-up period when they are most vulnerable. Incubators provide hands-on management assistance, access to financing and orchestrated exposure to critical business or technical support services. They also offer entrepreneurial firms shared office services, access to equipment, flexible leases and expandable space—all under one roof." Of course, an incubation program's main goal is to produce successful graduates (businesses that are financially viable and freestanding when they leave the incubator) usually in 2 to 3 yr. Thirty percent of national incubator clients typically graduate each year (NBIA 1998).

According to the FRA, basic shell rents for new multi-tenant research buildings currently run in the range of \$9 to \$13. Specialized interior improvements, such as those proposed for the EDA incubator, typically run between \$60 and \$100/sq ft. When improvements are amortized over the lease (\$9 to \$11/sq ft) and added to the basic shell rent, supportable rents generally range between \$20 to \$22/sq ft (NNN). Grubb & Ellis estimates that research and development (R&D) rental rates range from \$7.50 to \$11 (NNN) in the Denver metropolitan area. Similarly, the Omaha District's appraisal market analysis indicates that low and high rental rates for comparable office shell properties range between \$4 and \$12/sq ft (NNN), depending on the age of the building, location, and other factors. Thus, when it is assumed that incubator improvements total \$10/sq ft, a basic FRA shell rent of \$8/sq ft is calculated, suggesting that rental rates are near the lower end of the market. This strategy would appear reasonable given the fact than an incubator should represent a lower cost alternative to emerging businesses. When businesses "graduate" to the bioscience park, it is presumed that multi-tenant market rates of \$20 to \$22 would be within economic means.

Finally, in the opinion of USACERL, the EDA incubator represents an excellent opportunity to generate early project momentum for the bioscience park. Of 20 UCHSC company affiliates interviewed for the EDA grant application, 50% indicated an interest in the incubator and/or multi-tenant space at Fitzsimons. This level of interest, and the availability of a fully operational incubator in

1999, should result in a fairly rapid lease-up of the incubator offering, and establish the first major success in the bioscience park.

Bioscience Park Absorption and Pricing

Absorption. As stated in the previous section, the FRA projects average annual absorption of 62,400 sq ft (4.7 acres) in the bioscience park over 25 years. This results in a full build-out of 1.5 million sq ft, representing the development of 0.7 and 0.86 million sq ft of single-tenant space and multi-tenant space, respectively. The *Market Feasibility Study for a Bioscience Park at Fitzsimons Army Medical Center* (EPS 1996) and the Corps' of Engineers, Omaha District appraisal market analysis both suggest that annual absorption in bioscience parks generally ranges from 5,000 to 93,000 sq ft.* The appraisal market analysis drew upon a larger sampling of bioscience parks, which average 196 acres in size and on average absorb 53,300 sq ft annually. At face value, these considerations seem to suggest that the FRA's projected annual absorption is within a range of reasonableness and that the sizing of the bioscience park (147 acres) is generally consistent with national market trends.

However, although it may be useful to evaluate national real estate trends in bioscience for comparative analysis purposes, it is the belief of USACERL that site- and region-specific factors should ultimately be accorded more weight. Given this consideration, USACERL finds the FRA's absorption schedule reasonable in light of UCHSC's current relocation program to Fitzsimons and the market positioning of the bioscience park relative to UCHSC and general industry trends. Moreover, Fitzsimons is now home to its first four bioscience tenants: Myogen, TLR Labs, Integrated Systems Physiology, and Western Neutraceuticals. All four companies are currently located in the UCHSC parcel of Fitzsimons on an interim basis while the bioscience park and EDA incubator are prepared for development. Thus, to the extent that UCHSC maintains its relocation timelines and investments, the FRA will likely capture a reasonable share of technology transfer activity.

Pricing. According to Denver commercial real estate brokers, the relevant real estate submarkets for Fitzsimons are Airport/Montbello, East (Aurora),

* The parks evaluated by the Omaha District include: Chicago Technology Park, Chicago, IL; Devens Commerce Center, MA; Hopkins Bayview Research Campus, MD; Massachusetts Biotechnology Park, MA; University Research Park, VA; and Rensselaer Technology Park, NY.

Southeast, and to an extent Boulder because of the strong presence of the bio-science industry (Figure 4). Market information from Grubb & Ellis suggests the average value of industrial land within the Denver market is \$51,000 per acre, although it is unclear whether this price reflects improved or unimproved land. The Omaha District provided more detailed industrial land sale comparables, which range from between \$30,492 to \$112,820, depending on location and level of site improvements. The market comparables provided result in an average land sale price of \$67,495 per acre. In addition, USACERL evaluated comparable land prices for office and mixed uses, which reflects the tendency of bioscience space users to seek a higher quality product because of the presence of highly educated researchers. In general, land prices for office and mixed uses averaged between \$176,000 and \$400,000 per acre in the Denver metropolitan region (Grubb & Ellis 1998). Relevant comparables provided by the Omaha District suggest a price range between \$30,000 and \$290,000 per acre, with an average sale price of an initial land sale price of \$163,100 per acre.

Thus, average land prices from relevant submarkets range from \$67,495 to \$163,100 per acre, depending on land use, level of improvements, and location. This compares with the FRA's initial average land price of \$104,500 per acre, which reflects a high level of site improvements—nearly \$73,000 per acre (Table B5).^{*} Based on the foregoing, USACERL concludes that the FRA's land prices are within a range of reasonableness as they reflect a high degree of site improvements, a specialized use (bioscience), and an excellent location adjacent to the future location of the UCHSC main campus.

In terms of ground lease rates for bioscience park multi-tenant space, no relevant market comparables were available for review. However, the FRA provided a feasibility analysis to test the reasonableness of developed rates. Table B2 contains a recast of the analysis, and demonstrates that when a \$104,500 per acre land value is converted to a ground lease of \$43,200 per year (\$9,400 per acre), overall developer financial feasibility is maintained as evidenced by a positive \$1.5 million net present value (NPV). Thus, based on the reasonable market and financial assumptions presented by the FRA in the multi-tenant feasibility analysis, USACERL supports the use of a per-sq-ft ground lease rate of \$0.72.[†]

* Assumes nearly \$24 million in proposed FRA capital improvements for the EDC parcel, including building demolition, trunk and sub-trunk road and utility improvements, and the preparation of the golf course for Phases III and IV of the reuse plan.

† This rate reflects a per building sq ft factor, rather than a rate reflecting the per sq ft rate for land.

USACERL bioscience park conclusions. Based on the foregoing analysis of the UCHSC, Colorado's bioscience industry, general bioscience trends, and the FRA's real estate pricing profile, USACERL concludes the FRA stands a reasonable probability of absorbing 1.5 million sq ft of bioscience park land over the course of 25 years. USACERL finds the following factors most compelling in reaching this conclusion:

- The onsite presence of UCHSC will provide a catalyst for technology transfer, which the FRA is well positioned to capture through its bioscience park offering, that is viewed as adding economic value to the bioscience process (i.e., basic research to full-scale product manufacturing)
- UCHSC is fully committed, financially and politically, to the Fitzsimons site and is nurturing a substantive relationship with the FRA and its bioscience park tenants
- The State of Colorado has recognized the importance of the bioscience industry and has devoted financial and in-kind assistance to encourage further growth and expansion
- The Fitzsimons site is viewed by the State as a strategic location to consolidate an otherwise geographically dispersed industry and provide a central point of focus
- The FRA's pricing of real estate products falls within a range of reasonableness and to an extent addresses the unique needs of bioscience users, but the FRA should remain alert to pricing pressures in nearby competitive offerings such as Lowry, Stapleton, and Gateway Park.

Residential. The Fitzsimons Redevelopment Plan contemplates the reuse of the Series 700 and 800 housing on an interim basis until the land is required by UCHSC for development activities. The area of these sites comprises roughly 20.1 acres of land and 490 units. A 16.2 acre site is located south of the West Harlow Avenue entrance and to the north of East 17th Avenue and west of South Sutton Street. The site is planned to accommodate a state veterans nursing home and domiciliary on approximately 8 to 12 acres, with complementary elderly housing built on the remainder of the site. The Colonels Row housing may also be leased on an interim basis (see Figure 3).

USACERL findings. The FRA conducted a market analysis to determine reasonable ranges of rental rates for multi-family offerings. Relevant apartment projects in the study have been exhibiting occupancy rates ranging from 75 to 98

percent. Rental rates for comparable units range from \$305 a month for a studio to \$950 for a three-bedroom, two-bath apartment. Most of the Fitzsimons units have two or three bedrooms and one bathroom. They range in size from 974 to 1,200 sq ft, with Colonels Row housing and four large units exceeding 1,600 sq ft each. In comparison with competing projects, the Fitzsimons offering features lower density, mature trees, and access to open space. However, the lack of a second bathroom does put Fitzsimons at a marketing disadvantage. Supportable rents developed by the FRA appear reasonable in light of the performance of comparative projects. Table 4.2 below summarizes the FRA's pricing strategy:

Table 4.2. FRA residential rental rates.

Unit Type	Square Feet	Monthly Rent
Two-Bedroom, One-Bath	970-1,130	\$575-\$655
Three-Bedroom, One-Bath	990-1,200	\$555-\$650
Four-Bedroom, Two-Bath	1,625-2,131	\$780-\$940
Duplex	1,600-2,100	\$785-\$925

The Air Force has expressed an interest in having some Fitzsimons housing available to military families based at Buckley Air National Guard Base and elsewhere in the Denver area. The families leasing at Fitzsimons are expected to have housing allowances of roughly \$647 per month, which falls within the proposed range of rental rates for the FRA's offering.

Existing buildings. As mentioned, the FRA contemplates the long-term leasing of eight Fitzsimons buildings for generating revenue. In addition, the FRA proposes interim leasing for no longer than 9 yr for seven existing buildings, at which time demolition is proposed. Table 4.3 contains a summary of the applicant's proposed reuse and pricing for each long-term reusable building.

According to the FRA, some buildings will need improvements to bring them to code-compliant, marketable, and functional standards. Indeed, the FRA has programmed \$0.3 million (in 1997 dollars) for installing package boilers to the seven buildings listed in Table 4.3. This strategy is in response to the potential need to decommission the Central Heat Plant due to anticipated operating inefficiencies (a more extensive discussion of the Central Heat Plant is contained in Chapter 5, **Need and Extent of Proposed Infrastructure Improvements**). In addition, roughly \$0.35 million (in 1997 dollars) has been budgeted for various building improvements, including the replacement of the sanitary sewer system in Building 628. Table B1 contains a summary of anticipated revenues and costs for the buildings listed in Table 4.3.

Table 4.3. FRA pricing strategy for reusable buildings.

Building	Reuse	Rental Rate (NNN)	Square Feet
642 (Community Club)	Restaurant/Catering Facility	\$6.00 sq ft	14,395
816 (Burger King)	Fast-food Restaurant	\$10.00 sq ft	2,695
628 (Optical Fabrication Laboratory)	Light Industrial/R&D	\$5.00 sq ft	25,891
262 (Central Steam Plant)	Interim Lab Space	\$8.80 sq ft	11,900
288	Flex (industrial/office)	\$8.00 sq ft	27,900
289	Flex (industrial/office)	\$6.00 sq ft	14,400
290 (Admin Portion)	Office	\$11.00 sq ft	25,000

Interim buildings. According to the FRA, a limited number of additional buildings may have potential for short-term use before the underlying land is needed for new development. However, it argues that significant costs would be a prerequisite before viable reuse would be feasible. Because the FRA has assumed in the EDC business plan that the Central Heat Plant will be decommissioned, several potential interim reuse buildings were excluded from the analysis due to the prohibitively costly proposition of installing package boilers only for short-term use. Table 4.4 briefly summarizes proposed reuse and pricing for reusable buildings, which can also be found in an expanded form in Table B1.

Table 4.4. Summary of proposed reuse and pricing for reusable buildings.

Building	Reuse	Rental Rate (NNN)	Square Feet
118	Office/R&D	\$11.00	10,381
500 2North (a)	Interim Lab Space	\$12.00	7,925

USACERL findings. In general, USACERL finds the FRA's proposed pricing of long- and short-term reusable buildings reasonable. For the purposes of this analysis, USACERL segmented industrial and office markets (see Figure 4) to better capture individual market pricing pressures. Chapter 7, **Local and Regional Real Estate Market Conditions** contains a more detailed treatment of industrial and office submarkets and overall market activity.

The relevant industrial submarket for Fitzsimons industrial space, according to local real estate brokers, includes: Airport/Montbello, East (Aurora), and Southeast (Figure 4). In terms of industrial vacancies in these markets, 1997 rates were 5.8%, 0.6%, and 4.9%, respectively, which compares with an overall Denver rate of 4.8%, which is well below the national average of 8.3% (Grubb & Ellis 1998). Average asking industrial rental rates in these markets range from \$6.28/sq ft in Southeast to \$3.65/sq ft in the Airport/Montbello submarket. Average flex rental rates generally range between \$8.75 and \$4.18/sq ft on a NNN basis. These ranges compare favorably with the FRA's proposed industrial

rents of between \$5.00 and \$8.80/sq ft, with the higher end of the range representing more specialized industrial space that supports bioscience activities.

In terms of office market characteristics, Airport/Montbello, East (Aurora), and Southeast markets posted 1997 vacancy rates of 22.1%, 9.5%, and 9.1%, suggesting a softer market relative to industrial. Class B rental rates for these markets ranged from \$15.85 to \$12.26 in Boulder and Airport/Montbello markets, respectively. Research and development space was active in the Southeast market, which borders Aurora to the west. Typical R&D rates ranged between \$7.50 and \$11.00/sq ft (NNN). 1997 office and R&D leasing activity suggests that the FRA's pricing for existing Class B offerings, which ranges between \$6.00 and \$11.00, falls within a range of reasonableness but does not offer an apparent discount.

Finally, the FRA's projected lease-up schedule for reusable buildings appears reasonable (Table B1). Many of the buildings are envisioned as "swing space" for bioscience park and UCHSC tenants as buildings are constructed or operations relocated. For example, Building 262 is expected to serve as interim space for tenants interested in eventually locating in a multi-tenant building. To the extent that UCHSC maintains its relocation schedule to Fitzsimons, a reasonable stream of demand should be generated for reusable facilities, if only on an interim basis.

Golf course. The City of Aurora will operate the 129.7 acre golf course and driving range as a municipal course until the property is required for bioscience research park development in Phases III and IV (see Figure 3). Based on the FRA's land absorption for the bioscience park, the golf course is expected to be available for operations for 12 years (2009). At that time, it will need to contract to a nine-hole course for an additional 6 years of operation. The City of Aurora will be reimbursed for direct operating costs as well as overhead costs. Course improvements and deferred maintenance are expected to require an investment of \$300,000 financed at a 6.0% interest rate in the first 2 yr of operation. Following that investment, golf course operation is expected to generate revenues in excess of expenses, and thus support overall FRA redevelopment efforts (see Table B4). Because several new golf courses are being opened in Aurora and because the Fitzsimons golf course will not warrant significant investment for improvement in later years, operating costs are expected to increase more rapidly than revenues over the 12 yr of operation as an 18-hole course. In addition, the course will offer discounts to military personnel and retirees. Once the golf course is reduced to nine holes, it is expected to only operate on a break-even basis financially.

USACERL findings. USACERL was unable to verify golf course revenues or expenditures based on the information provided by the FRA. However, the Omaha District provided the market analysis developed for the golf course appraisal. In general, golf course revenues projected by the applicant fall slightly below appraisal figures, but not to an extent where they could be construed as being unreasonable. First-year revenues are projected at \$0.97 million and \$1.3 million for the EDC business plan and appraisal, respectively. Similarly, FRA expenses fall marginally below appraisal estimates, but are within the same order of magnitude. First-year expenses are estimated at \$0.95 million and \$1.0 million for the FRA business plan and Omaha appraisal, respectively. Thus it is USACERL's conclusion that the FRA's golf course analysis, although lacking substantive technical support, does appear reasonable when evaluated against the more rigorous analysis conducted by the Omaha District.

Commercial. According to the FRA, long-term commercial development of properties in the Fitzsimons "town center" and at the corner of Colfax and Potomac will depend on the pace of development at UCHSC and the bioscience park. In the near term, UCHSC activity is likely to be limited to occupancy of Building 500 and the new Cancer Center and research building scheduled for opening in 2000. With the opening of these facilities, low-level commercial development is envisioned by the FRA. Space requirements are expected to begin at roughly 5,000 sq ft and grow to an estimated 50,000 sq ft over a 10-yr period. Development can be expected to support land values equal to \$16 per building sq ft, or \$0.69 million per acre. Properties are likely to be leased to a developer at a rate of 9% of land value per year, or \$1.44 per building sq ft. Table B1 contains a summary of commercial use revenues.

Development of the Colfax property will be delayed due to a no-cost interim lease with the Regional Transportation District, anticipated to run 10 yr. At the expiration of the lease, market conditions in the surrounding neighborhood should be improved, supporting redevelopment for retail or hotel use. That property is assumed to sell in 2008 for the equivalent of \$4 per land sq ft.

USACERL findings. USACERL has interpreted the FRA's commercial development plans to be primarily site-serving in nature. In other words, commercial development is not intended to compete on a regional scale and should only be warranted when there is sufficient onsite demand from UCHSC and bioscience park tenants. As USACERL independently verified earlier in this section, UCHSC is currently committed to a \$2 billion relocation to Fitzsimons over a 20-yr period resulting in 5.0 million sq ft of building space. In parallel with UCHSC's efforts, the FRA intends to capture a reasonable share of UCHSC spin-

off or "tech transfer" activity resulting from research and clinical efforts. Thus, it is USACERL's opinion that the FRA's projected absorption of commercial space is reasonable to the extent that UCHSC and the FRA build-out their respective properties over 20 to 25 yr as currently planned.

In terms of real estate pricing corroboration, USACERL relied on the 1998 Grubb & Ellis real estate report for Denver. Aurora lies within the "Southeast Suburban" retail submarket. The submarket is characterized by a 5.8% vacancy rate, which compares favorably with the Denver metropolitan average of 6.4%. In terms of rental rates, space is renting for between \$15.53 and \$13.66/sq ft, for Community Center and Neighborhood Center products, respectively. Based on the foregoing, the FRA's use of \$16/sq ft would appear to be above submarket averages. However, the FRA does not anticipate leasing activity until 2001, at which time a \$16/sq ft rent may be supportable.

Infrastructure Phasing and Cost Assumptions

The FRA contemplates a 25-yr capital investment of \$22.7 million (1998 dollars) in EDC-related infrastructure to support economic development and job creation. USACERL provides its infrastructure findings in Chapter 5, **Need and Extent of Proposed Infrastructure Improvements** of this review. Table B5 provides an overview of the FRA's proposed infrastructure investment in job creation and economic development. A summary of those costs follows:

- \$4.1 million – roadway improvements
- \$1.0 million – improvements to the domestic water system
- \$0.76 million – improvements to the sanitary sewer system
- \$1.8 million – storm sewer improvements
- \$10.5 million – building demolition
- \$4.5 million – bioscience park-specific improvements.

One of the central tenets of the Infrastructure Master Plan (FRA 1997) is a "pay as you go" system, which avoids the "front loading" of capital costs that is so commonly observed in other EDC submissions. Phased infrastructure improvements are programmed in concert with the overall phasing of anticipated development, to avoid encumbering the project with significant up-front debt.

According to the FRA, the key uncertainty surrounding the Infrastructure Master Plan is the future of the Central Steam Plant. The new state-of-the-art plant was completed in 1996 and was designed to serve approximately 3 million sq ft of development. But it is probably only economic to operate at 2 million sq ft of space. At lower use levels, the overhead costs are prohibitively expensive. The fundamental question raised by the FRA is whether the low levels of demand in the initial years would be better served by developing individual package boilers rather than linking to an oversized central heating facility.

USACERL findings. USACERL's conclusions as substantiated in Chapter 5 are that the FRA's total infrastructure redevelopment costs are likely overstated by as much as \$4.2 million. In general, USACERL took exception to the FRA's use of a 44% contingency. USACERL finds that a more reasonable contingency factor ranges between 10 to 30% based on industry standards. Specific findings on an individual improvement basis include the following (also included in Table B7):

- Roads – USACERL estimates \$3.8 million versus the FRA's estimate of \$4.1 million.
- Domestic water – USACERL estimates \$1.35 million in comparison to \$1.0 million, with the difference attributable to minor design differences.
- Sanitary sewer – USACERL estimates \$0.55 million in comparison to the FRA's estimate of \$0.76 million. USACERL's investigation revealed that the addition of lift stations allows for the reuse of existing water lines that would otherwise require replacement.
- Storm sewer – USACERL estimated a need for \$1.17 million versus the FRA's estimate of \$1.8 million with the primary justification being the lack of engineering support for proposed retention ponds and a golf swale.
- Demolition – USACERL estimates total demolition costs at \$8.1 million in comparison to the FRA's estimate of \$10.5 million. USACERL's key finding relates to the FRA's apparent overstatement of the extent of crawlspace asbestos.
- Bioscience park – USACERL estimates total bioscience park-specific improvements at \$3.3 million, compared with the FRA estimate of \$4.5 million. Two factors contributed to USACERL's finding: (1) the FRA estimates that park improvements apply to 133 acres while USACERL only measured 119 acres, and (2) the FRA included costs to extend central heating

plant steam and condensate lines in the park while the business plan makes the assumption that it will be decommissioned after 2 yr.

In addition, although an operating expense item, the FRA failed to include pro-rated stream plant operating costs of nearly \$0.5 million to address the need for steam on an interim basis while buildings are retrofit with individual package boilers. These costs would likely occur from July 1999 through the year 2000.

In summary, USACERL calculates a development infrastructure program of \$18.5 million (including steam plant operations costs), which is nearly 18% less than the FRA estimate of \$22.7 million.

Operating expenses. The FRA has programmed nearly \$0.6 million in operations and maintenance costs for 1998, the first year of the business plan. Operating expenses escalate annually at an average rate of 4.3%. The largest component of the FRA's 25-yr \$28.2 million operating expense investment is administration and marketing, representing over \$21 million (75%). The second largest business plan expense component is the operating contingency, which totals \$3.5 million over 25 years. The balance of operating expenses include insurance, professional fees, maintenance, and snow plowing.

USACERL Operating Expense Findings

On balance, USACERL finds business plan operating expenses to be reasonable and directly related to the FRA's ability to generate revenues from leasing and sales activity. When operating costs are viewed in relationship to effective gross revenues, USACERL concludes that over the long run, expenses fall within a range of reasonableness. As would be expected with any large-scale real estate development, operating expenses consume most, if not all, of effective revenues in the early lean years of development. Fitzsimons is no different as evidenced by an average first 2-yr operating cost ratio of 111%. However, operating costs do stabilize to an extent beyond Year 5 (2002) with operating expense ratios ranging between 23 and 50% with an average 45% ratio for 25 yr. This range is well within industry averages for similarly sized projects.

However, the largest component of operating expenses, administration and marketing, typically decreases over time, based on other base reuse experiences. This decrease is ostensibly due to the mission of an LRA to sell and lease facilities in a timely manner, thus reducing administration and marketing costs over time. In the case of the FRA, these costs escalate at a constant 3% per annum rate, despite the build-out and leasing of EDC properties. However, in USACERL's opinion, this assumption may be reasonable considering the nature

of the redevelopment effort. As stated elsewhere, the bioscience industry is characterized by volatility at all levels. Because of this, bioscience park tenants and potential bioscience companies will likely have real estate requirements that change more frequently than the typical business. Thus, it is reasonable to assume that the FRA must respond to these changing requirements over time, and with more frequency, as the bioscience park nears full build-out and retention efforts become a priority.

FRA Business and Operations Plan Summary

To this point, USACERL has provided a detailed account of each business plan revenue and cost center. The intent of this section is to summarize the key findings of USACERL's recast of the FRA business and operations plan summary, which are contained in Table B6. A discussion follows below (all figures expressed in inflated dollars):

- USACERL forecast 25-yr total development revenues at \$83.9 million. Year 1 revenues total \$0.48 million and increase at a relatively constant rate to \$3.5 million in Year 25, representing absorption of the full build-out of bioscience park and leasing of existing buildings. The largest revenue component is Building Reuse Revenue, which represents over \$22.3 million of total revenues (26.5%). The second largest component is ground lease revenues from the bioscience park totaling \$20.1 million (24%). Of this amount, \$9.5 million represents the sale of the land in Year 25 to an investor at a capitalization rate of 11%. The third largest revenue component is net cash flow from the EDA incubator totaling \$19.9 million (23.7%). Other revenues include: land sales - \$9.9 million; golf course net revenue - \$0.91 million; interim reuse revenue - \$0.74 million; commercial ground lease revenue - \$2.8 million; residential rent - \$6.5 million; and Office of Economic Adjustment (OEA) grant funding - \$1.0 million.
- Infrastructure costs total \$31.4 million over 25 yr assuming 3% inflation per annum. The 25-yr low and high expenditures equal \$0.09 million and \$5.0 million, respectively, with a majority of improvements programmed within the first 12 yr of redevelopment (\$25.3 million).
- USACERL calculated operating costs at \$28.2 million over 25 yr. Operating expenses are lowest in Year 1 at \$0.58 million and increase steadily to \$1.5 million in Year 25. As indicated earlier, administration and marketing costs represent the largest component of operating expenses—nearly 76% of the 25-yr total.

- Annual cash flows are calculated by subtracting infrastructure development costs and operations costs from development revenues. Throughout the 25-yr pro forma, only 6 yr are marked with negative cash flows; the largest of which is *negative* \$3.2 million. Positive annual cash flows vary from a low of \$0.20 million in Year 7 to a high of \$10.7 million in Year 25, reflecting the sale of bioscience park ground lease land.
- As calculated by USACERL, cumulative 25-yr cash flow for the FRA business plan totals *positive* \$24.3 million, with annual flows ranging from negative \$3.4 to positive \$13.6 million. Finally, USACERL calculated the 25-yr NPV of the FRA business plan at positive \$1.2 million, with a 15% discount rate, which compares favorably with the FRA calculation of \$1.0 million. For the sake of comparison, an 11% discount rate was applied to 25-yr cash flows, resulting in a project NPV of positive \$2.5 million.

USACERL Findings

In general, the applicant has proffered a defensible business plan that is consistent with commercial real estate practices. However, USACERL challenges the assumptions and findings made in three areas: (1) need and extent of infrastructure, (2) reversion revenues for reusable buildings in Year 25, and (3) the exclusion of central heating plant operating costs. An expanded discussion of these finding can be found later in the **Scenario and Sensitivity Analysis** section.

Market Feasibility Analysis

In determining the financial feasibility of a development, it is necessary to first establish market feasibility; that is, whether there is sufficient demand to absorb the offered space within the projected time frame and at pro forma market rates. The data and information gathered and reviewed by USACERL suggest that it is feasible to absorb nearly 1.8 million sq ft of new and existing space by the market over 25 yr.

USACERL Findings

The FRA provides a compelling analysis, which suggests that primary demand for EDC properties will be generated by UCHSC. USACERL's independent third-party review of the FRA's market feasibility assumptions revealed a high degree of reasonableness. In interviews conducted with University of Colorado staff, USACERL verified the proposed relocation plan to Fitzsimons and the

desired outcome. According to the university staff, the current 47-acre site for UCHSC has served its purpose well, but represents a limitation to currently explosive growth in the medical and clinical program. After the BRAC 1995 announcement, Fitzsimons emerged as a strategic opportunity to expand UCHSC operations with a combination of existing buildings and equipment, and developable land.

UCHSC contemplates a 20-yr (or more) relocation and build-out schedule with total facilities exceeding 5.0 million sq ft. To accomplish this task, nearly \$2.0 billion will be required. The University of Colorado Board of Regents and Colorado State Legislature appear prepared to make the 20-yr investment in Fitzsimons. Indeed, nearly \$20 million has already been budgeted for the renovation of Building 500. Moreover, UCHSC has demonstrated a willingness to be a strong partner in the redevelopment of Fitzsimons by entering into cooperative infrastructure agreements, providing UCHSC lab space and equipment to bioscience park tenants for use, and creating a synergistic research environment that will encourage faculty and researcher sharing.

Through the EDC request, the FRA is positioning to capture spin-off activity generated by UCHSC. The primary implementing strategy to accomplish this is proposed 147-acre bioscience park that will likely accommodate the unique requirements of the bioscience industry. An important first step toward the realization of job creation and economic development efforts is the proposed 60,000-sq ft bioscience incubator, which will likely generate early project momentum, and should be fully leased by the year 2000. The FRA's intent is to move graduates from the incubator to the bioscience park where land and space will be available to address a company's changing real estate requirements throughout the bioscience business cycle. Other signs of early success include Fitzsimons' first four bioscience tenants, who are currently located on the UCHSC parcel on an interim basis until the incubator and bioscience park land are prepared.

These factors are set against a backdrop of state and national trends that suggest broader support for the redevelopment effort. The State of Colorado has formally designated bioscience as one of its top five industries for the next century. To facilitate the development of the industry, the state has various financial and in-kind assistance programs such as the Colorado Advanced Technology Institute and Colorado Bio/Medical Venture Center, which serve as catalysts for industry information exchange and business assistance. Interviews with state officials indicated that Fitzsimons is viewed as being an important investment for Colorado and will potentially provide a central geographic focus in an otherwise scattered industry. Additionally, bioscience is finally beginning

to be recognized as the new high technology sector for the future as the population ages and Wall Street invests billions of dollars in bioscience companies.

It is USACERL's conclusion that sufficient market feasibility exists to absorb over 1.5 million sq ft of bioscience park land and 0.3 million sq ft of supporting commercial, office, and industrial facilities over 25 years to the extent that UCHSC maintains its 20-yr schedule. However, the development of the bioscience park is not without additional market risk. Boulder County will remain the hub of the bioscience industry for some time until Fitzsimons has sufficiently established itself as a viable location alternative. In the intervening years, Boulder will likely capture a large share of bioscience development, but development costs are escalating rapidly due to the imposition of urban growth boundaries and a depletion of land supply.

In addition, there is a large competitive supply in the immediate areas surrounding Fitzsimons, including the former Lowry Air Force Base, Stapleton Airport, and the Gateway Business Park. Although there does not appear to be a pronounced downward pressure on rental or land sales rates from a glut of space, other developments may be better positioned to provide more competitive pricing to potential bioscience park users. To some extent, this concern will be mitigated due to the specific bioscience reuse of Fitzsimons, which does not directly compete with the more general business/industrial park offerings observed at competing sites. However, the FRA must (in conjunction with UCHSC) devise a targeted marketing and outreach campaign early during redevelopment to communicate the numerous benefits of locating at Fitzsimons, so location decisions are not based solely on real estate costs or historic patterns of bioscience location in Boulder.

USACERL-Developed Scenario

Approach

Based on the conclusions and findings discussed at length earlier in this chapter, USACERL developed the CERL1 Scenario to provide an analysis of the impact to FRA business plan cash flows and NPV. CERL1 was developed using two major assumptions and one project view, which are discussed below. Also highlighted below are the impacts to forecasted revenues and costs (see Tables B7, B8, and B9). It is worth noting that USACERL included \$0.72 million in central heating plant operating costs in all scenarios, reflecting the Army's current position to cease operations by July 1999.

The alternative project view corrects the FRA's apparent omission of the sale of long-term reusable buildings to an investor(s) in Year 25. Stabilized Year 25 revenue of \$1.2 million was reduced by half—to reflect potential vacancy and operating costs—to arrive at a stabilized net operating income of \$0.6 million. Then a capitalization rate of 15% was used to calculate a value of \$4.0 million.

CERL1 Scenario Assumptions

1. The first assumption considers the volatility of the bioscience industry, the currently unproven market for Fitzsimons, and potential delays in UCHSC's relocation strategy by reducing the 25-yr bioscience park by 260,000 sq ft in the early years of redevelopment. All findings are also summarized in Table B9.
 - all other business plan assumptions held constant
 - reduces estimated 25-yr revenues by \$3.4 million, but by only \$0.68 million when the project view is applied
 - *cash flow impact* – cumulative 25-yr cash flow decreases from *positive* \$23.6 million to *positive* \$20.27 million, but actually improves to \$24.27 million under the alternative project view
 - *NPV impact* – project NPV decreases sharply from *positive* \$0.72 million to \$1.9 million at 15 and 11% discount rates to a new range of *negative* \$0.19 to \$0.95 million.
2. The second assumption decreases the overall infrastructure investment based on USACERL's independent findings as to proposed need and extent.
 - 25-yr absorption returned to FRA levels
 - decreases development costs from \$32.1 million to \$25.8 million
 - *revenue impact* – under the alternative project view, revenues increase by \$4.0 million to \$87.9 million
 - *cash flow impact* – cumulative 25-yr cash flow increases sharply from *positive* \$23.6 to *positive* \$33.9 million

- *NPV impact* – project NPV increases from *positive* \$0.72 million to \$1.9 million at 15 and 11% discount rates to a new range of *positive* \$2.5 to \$4.5 million.

Scenario and Sensitivity Analysis

Table B9 summarizes the impacts to revenues, infrastructure costs, operating expenses, total cash flows, and 25-yr NPVs of the USACERL scenario assumptions under one alternative project view. The NPV calculations are for 15 and 11% discount rates over the total 25-yr project analysis period. The sensitivity of the assumptions represented in CERL1 was compared with USACERL's recast of the FRA business plan.

As detailed in Table B9, the CERL1 Scenario had a significant impact on the FRA's business plan pro forma. The preferred alternative scenario assumption combined for a total revenue increase of \$4.0 million and reduced development costs by \$6.3 million (line 26). The total impact to project cash flows amounted to an increase of \$10.6 million, which results in an increase in NPV of \$1.8 million using a 15% discount rate and \$2.6 million at the 11% discount rate.

The positive impact from USACERL's independently defensible alternative scenario substantially improved the NPV of the business plan. The \$1.8 to \$2.6 million improvement to NPVs resulted in NPV range estimations of *positive* \$2.5 million to *positive* \$4.5 million under the CERL1 Scenario. CERL1 assumes a reasonable reduction in infrastructure improvements and the sale of long-term reusable buildings to an investor(s) in Year 25.

However, the FRA business plan is still characterized by a degree of sensitivity. A moderate reduction in early project absorption creates *negative* NPV at a 15% discount rate, suggesting a potential threat to long-term financial feasibility. Financial feasibility considerations are expanded upon in the section below.

Financial Feasibility Analysis

Traditional commercial real estate investment financial feasibility analysis requires investors to make reasonable forecasts of potential gains and exercise sound judgment as to the level of risk exposure. A technique to assist in this evaluation is the discounting, back to NPV, of the forecasted future cash flows and estimated residual value of the development at the end of the investment period. The discount rate is determined by an assessment of the level of risk, and can be equated to the required rate of return the investor seeks with similar

investments. The FRA has elected to use a 15% discount rate reflecting the organization's cost of capital plus a risk premium to compensate for the length of the redevelopment project and the inherent uncertainties of the bioscience industry. USACERL developed an alternative project discount rate of 11% to again reflect not only the cost of capital, but also a reduced risk premium addressing the fact that the FRA is a public body that does not undertake development projects for the same profit-driven reasons a private developer might. In sum, a range of discount rates from 15 to 11% is reasonable due to the high level of risk and investment the FRA is proposing to underwrite, coupled with the uncertainty inherent in any long-term pro forma forecast for a large property.

Although USACERL was able to independently corroborate the FRA's claims that the business plan is financially feasible, some concerns still exist. As noted in the CERL1 Scenario, a reduction in project absorption could jeopardize overall project financial feasibility; in effect, creating a situation where costs outstrip revenues. In addition, although the CERL1 recommended scenario demonstrates a notable improvement in project NPV, negative cash flows still persist. To address these concerns the FRA will seek external financial assistance to fill gaps between development costs and potential revenues.

The FRA and USACERL project a \$1.2 million deficit during the first 2 yr of operation. The deficit is proposed to be met through a series of funding sources, including the City of Aurora, the State of Colorado, and the EDA. The City has committed \$0.30 million in operating funds to match the OEA planning grant. Funding of \$1 to \$2 million will be sought from the State if Colorado legislature to support redevelopment. Additionally, annual deficits generated in Years 9 and 10, which correspond with Phase II infrastructure improvements, are proposed to be met through additional EDA project grant funding.

Also potentially available would be the tax revenues generated by the City of Aurora from the redevelopment of Fitzsimons. With a current mill rate of 11.6 mills per \$1,000 of assessed value, the City could expect to receive \$0.58 million in incremental property tax revenues in 2005, increasing to \$1.16 million by 2009. Pledging 50% of incremental tax revenues from 2001 through 2009 would allow the City to cover \$2.7 million of infrastructure improvement costs.

In summary, the FRA has evaluated alternative financing mechanisms to cover projected operational shortfalls. To the extent that the FRA is able to receive fiscal assistance from external sources, overall business plan financial feasibility is improved.

Conclusion

USACERL finds that the FRA's business plan has a reasonable probability of achieving market and financial feasibility as proposed in the FRA's EDC application, and further developed through USACERL's alternative scenario. In terms of market feasibility, the proposed redevelopment of Fitzsimons capitalizes on a unique and synergistic relationship between the UCHSC and EDC Bioscience Park. To the extent that UCHSC maintains relocation timelines to Fitzsimons and the FRA effectively accommodates the unique requirements of "spin off" start-ups and affiliated companies of UCHSC, the economic development objectives promulgated in the reuse plan will likely be achieved.

In terms of financial feasibility, the FRA is seeking external financing for projected annual deficits and other contingencies, which should go a long way toward improving annual cash flows. However, the EDC business plan is not without financial risk. The CERL1 Scenario considers a moderate decrease in bioscience park absorption as an assumption change, which produces a negative 25-yr NPV. Nevertheless, a reduction in absorption does not appear to be likely at the time of this writing. Under the recommended CERL1 Scenario financial feasibility is enhanced through a supportable reduction in 25-yr capital costs and by recognizing the sale of long-term reusable buildings in Year 25. This scenario results in a business plan value of *positive* \$2.5 to \$4.5 million at 15 and 11% discount rates, respectively.

5 Need and Extent of Proposed Infrastructure Improvements

Prepared by:

Samuel L. Hunter, Civil Engineering, CECER-FL-P

Jane DeRose, Infrastructure Management Analyst, CECER-PL-E

Jeffrey G. Kirby, General Engineer, CECER-PL-E

Thomas Durbin, Mechanical Engineer, CECER-UL-U

Michael K. Brewer, Mechanical Engineer, CECER-UL-U

Chris Dilks, Mechanical Engineer, CECER-UL-U

Gary L. Gerdes, Environmental Engineer, CECER-UL-T

Richard L. Schneider, Architect, CECER-PL-N

Objectives

This chapter has two objectives. First, USACERL will determine if the FRA-proposed costs for the identified scope of work fall within the range of reasonableness of an independent estimate. Second, evaluate the need and extent of the proposed scope of infrastructure improvements as appropriate to encourage investment and job creation at the former Fitzsimons Army Medical Center (AMC) as specified in the Base Reuse Implementation Manual (DoD 1997).

Approach

USACERL made use of the following four-step methodology in conducting an evaluation of FRA infrastructure requirements identified in the EDC proposal.

Step 1: At the start of the effort, USACERL made a detailed review of the EDC application and the Reuse Plan. This review provided an overview of the condition of the installation's infrastructure (from the applicant's perspective), goals of the proposed Reuse Plan, magnitude of the capital improvement plan that the applicant feels is necessary to encourage growth, and available sources of information. USACERL used this information to develop a general strategy for the onsite fieldwork.

Step 2: USACERL technical specialists conducted a site visit to Fitzsimons on 25-27 February 1998. While there, they conducted a visual evaluation of the installation's major infrastructure systems. This infrastructure evaluation included:

- a. inspecting the infrastructure to determine a condition assessment
- b. identifying repair requirements to maintain that condition
- c. determining existing infrastructure limitations to the future functionality or carrying capacity or a functional assessment
- d. determining infrastructure improvements to meet anticipated future requirements arising from the Reuse Plan.

These findings were used in Step 4 to check the reasonableness of the EDC application's proposed scope and the associated cost estimates. Also during this site visit, USACERL gathered information from previous infrastructure assessments, interviewed FRA engineering staff members, and collected real property information.

Step 3: USACERL analyzed the field data, including a synthesis of the findings from the field surveys and collected information to:

- a. create a supportable baseline infrastructure condition assessment (using USACERL's developed tools from their Engineered Management Systems)
- b. develop "projects" to improve or maintain the infrastructure condition assessment
- c. determine any carrying capacity limitations imposed by the current infrastructure relative to envisioned full build-out
- d. identify the scope of necessary improvements.

USACERL made an independent cost estimate of the FRA-proposed infrastructure improvement plan to validate the proffered cost estimates. The purpose of this part of the review was to determine if the specified infrastructure improvements are necessary to provide adequate infrastructure functional requirements and to support the necessary investment and economic growth in the former Fitzsimons AMC.

Step 4: USACERL used the findings from Steps 2 and 3 to review the scope and necessity of the FRA improvement program and infrastructure cost estimates proposed by the FRA in the EDC application. USACERL conducted a detailed analysis of any differences, and will present findings later in this chapter.

Background

The FRA has proposed a 25-yr four-phase redevelopment approach, but does not specifically tie the identified yearly funding to the phasing. The EDC application does state, however, that "each phase is associated with a logical progression of development that extends infrastructure into the site, provides access, and creates a critical mass for development."* The application identifies some phasing triggers that are real estate market driven.

The application identifies the need to replace and expand all of the underground domestic water and sanitary sewer systems, partial replacement and expansion of the storm water collection system, and major rework of the transportation system. The roadways and underground utilities were divided into perimeter, trunk, subtrunk, and in-track components for estimation purposes. Electrical, natural gas, and communication systems outside of the building line will also be extensively redone, but commercial service providers will fund these improvements (according to the FRA). An important issue is whether the University of Colorado Health Science Center (UCHSC) and/or the FRA will use the new central heating plant to supply centralized heat and hot water to occupants of the former AMC. The FRA EDC application also includes property-wide infrastructure development costs for the bioscience research park. These roadways and utilities extensions, which are primarily in the 133-acre golf course area, and were estimated on a per acre basis.

Table 5.1 summarizes the infrastructure improvement programs (by phase) contained in the EDC application. USACERL developed an independent cost estimate for the scope of work identified within this proposal. For this comparison, USACERL developed independent quantity estimates from drawings to verify the EDC intended project scope for each of the underground utilities and roadway projects. The take-off quantities were used as a basis for developing a cost breakdown structure, which was then estimated using appropriate *RS Means*

* Fitzsimons Economic Development Conveyance Application, Appendix R, p 7-3, January 1998.

cost manuals and local cost adjustment factors. Any differences in scope estimates or significant unit cost differences are noted in the discussion.

Table 5.1. FRA cost estimates including contingency and soft costs.

Phase	Infrastructure Systems						
	Roads	Storm Water	Domestic Water	Sanitary Sewer	Building Demolition	Steam	Total
1		\$67,568	\$65,477	\$128,836			\$261,881
2	\$2,700,000	\$716,849	\$403,074	\$261,285			\$4,081,208
3	\$392,000	\$83,194	\$135,072	\$45,972			\$656,238
4	\$1,154,000	\$359,804	\$63,912	\$25,676			\$1,603,392
Other Projects		\$637,670	\$420,040	\$307,123	\$10,552,000		\$11,916,833
Total	\$4,246,000	\$1,865,085	\$1,087,575	\$768,892	\$10,552,000		\$18,519,552
Bioscience Park Improvements	\$2,175,000	\$531,000	\$796,000	\$464,000		\$531,000	\$4,496,000
EDC Total	\$6,421,000	\$2,396,085	\$1,883,575	\$1,232,892	\$10,552,000	\$531,000	\$23,016,552

USACERL's approach to conducting a cost comparison was to construct a "reasonable" cost range by using a 10% contingency factor to develop a minimum estimate and a 30% contingency factor for a maximum estimate. This approach was used both to evaluate the FRA cost estimate and the suggested USACERL infrastructure requirements that are identified as the CERL1 Scenario. Tables 5.2 and 5.3 show these comparisons later in this chapter.

Scope of FRA Proposal

Transportation. The FRA proposal (see Figure 3) includes the addition of a new road on the northern and eastern perimeter (Sand Creek Parkway), and the improvement of existing perimeter roads (Colfax Avenue and Peoria Street) on the southern and western borders of the installation. New connecting roads are proposed at 23rd and 17th avenues on the west and improvements to Charlie Kelly Boulevard at the eastern connection to the new Sand Creek Parkway. West Harlow will be extended on the eastern end to connect to the Sand Creek Parkway and both North 10th and North Cooper will be widened and will provide connectivity between the Sand Creek Parkway and West Harlow Avenue. North 4th will be extensively redone to provide access along the western edge of the golf course between West Harlow, the 23rd Avenue extension, and the Sand Creek Parkway. West Harlow Avenue will be widened and improved along its entire length.

Sanitary sewer. FRA proposes a complete replacement of the sanitary sewer collection system. The Army has agreed to decommission, remove, and

environmentally clean the current wastewater treatment plant so this expense is not reflected in either the FRA or USACERL estimates.

Domestic water. FRA proposes a complete replacement of the domestic water distribution system. This new system will also provide the ability for the FRA to switch from using the city of Denver's water supply to the city of Aurora, which will provide better capacity and pressures. The at-grade 1,200,000-gal water storage tank and booster pumps will remain until the domestic water lines are replaced. Removal costs were not estimated by either FRA or USACERL for the storage tank and booster pumps.

Storm sewer. The FRA plans to reuse the existing storm sewer system as much as possible. Revisions to the storm water system are proposed to be made when new roads are constructed, in the current golf course area, and by the construction of several retention ponds west and north of the installation.

Building demolition. Demolition expenses include the removal of buildings only.

Bioscience park. The application also includes property infrastructure development costs for the bioscience research park. These improvements include extending the existing domestic water, sanitary sewer, storm water, and transportation systems into the park area.

USACERL Evaluation of FRA Proposal

Noted in Table 5.2 and the narrative following Table 5.3 are USACERL's findings as they relate to the EDC application, visual inspection of Fitzsimons infrastructures, conversations with resident engineering personnel, review of FRA drawings and other real property records, and standard design and costing practices. Table 5.3 presents USACERL's findings as to the need and extent of the FRA's proposed infrastructure improvements based on independently developed condition assessments, estimated full build-out requirements, and the expertise of USACERL analysts.

In general, USACERL found the FRA's basic costs estimates were fairly close to USACERL estimates. As mentioned in the discussion of Table 5.1, park improvements were based upon a cost per acre. The technical team concurs with the cost per acre but differs with the number of acres. The technical team could only identify 119 acres related to the golf course. This value was used in the CERL1 Scenario so the infrastructure costs identified in Table 5.1 were reduced to 83%. Calculation differences between the EDC application and the USACERL incorporation of contingencies were different and tended to increase the EDC

application estimate by a much larger percentage. The USACERL approach applies 10 and 30% contingency factors to account for errors in estimation and other costs such as design and project management. The FRA approach was to add 20% contingency to the basic estimate and then add a 20% soft cost (project activities) to that combined total. Hence the FRA applies a total addition of 44% to the basic estimate, $(1.2)\times(1.2)$, whereas the maximum USACERL addition is only 30%. The basic estimates before contingencies were rather close as only 44% of project estimates by FRA were above the USACERL estimates. After the FRA's larger contingency and soft cost factors were applied, 61% of the FRA total project cost estimates were above the USACERL project cost estimate ranges (see Appendix C).

Table 5.2. Cost comparison by infrastructure system.

Systems	FRA Estimate	USACERL Cost Estimate	
		Low	High
Roads	\$4,246,000	\$3,250,000	\$3,842,120
Storm Water	\$1,865,085	\$1,419,284	\$1,570,637
Domestic Water	\$1,087,575	\$1,010,674	\$1,118,200
Sanitary Sewer	\$768,892	\$609,621	\$664,078
Building Demolition	\$10,552,000	\$4,748,000	\$8,007,000
Bioscience Park	\$4,496,000	\$3,966,000	\$4,496,000
Total	\$23,015,552	\$15,003,579	\$19,696,035

Table 5.3. Infrastructure need and extent cost comparison (CERL1).

Systems	FRA Estimate	CERL1 Scenario Cost Estimate	
		Low	High
Roads	\$4,246,000	\$2,952,500	\$3,490,120
Storm Water	\$1,865,085	\$1,258,895	\$1,374,480
Domestic Water	\$1,087,575	\$1,011,055	\$1,117,819
Sanitary Sewer	\$768,892	\$449,269	\$475,981
Building Demolition	\$10,552,000	\$4,748,000	\$8,007,000
Bioscience Park	\$4,496,000	\$3,558,100	\$3,558,100
Total	\$23,015,552	\$13,977,819	\$18,023,500

Roads. The major FRA road network is in very good condition for the current AMC configuration but will require extension and widening to effectively connect with the planned new roads. Proposed roadway improvements include a widening of the main East/West transportation corridor (West Harlow), improving North/South secondary roadways (North 10th and North Cooper), and construction of new roads, which includes the Sand Creek Parkway and the eastern extension of 23rd Avenue through the golf course to connect to the Sand Creek Parkway. Better connectivity to the southern part of the installation is proposed by construction of an eastern extension of 17th Avenue to South Hutton Street.

On the eastern boundary, an extension of West Harlow Avenue to the Sand Creek Parkway is planned as well as improvements to the eastern entrance via Charlie Kelly Boulevard. The technical review concurs with the concept of the proposed road system. Road improvements constitute the second largest part of the FRA infrastructure improvement program at **\$4,246,000** (Table 5.2). USACERL's estimates of road costs range between **\$3,250,000** and **\$3,842,120**. Details of FRA's cost estimates and USACERL's findings are documented in Appendix C.

USACERL need and extent findings for roads. USACERL concurs with the proposed layout and only differs with the requirement for the degree of widening West Harlow Boulevard. The technical evaluation determined that, with the exception of the western entrance and eastern connection to the Sand Creek Parkway, West Harlow was adequate as currently configured. Based upon these findings, USACERL estimates for the required road costs are approximately \$300,000 to \$352,000 less than those requested. The estimated range of required road improvements is between **\$2,952,500** and **\$3,490,120**.

Review of cost responsibility assignment also raised some questions. The FRA application identifies 17% of the Sand Creek Parkway and 50% of West Harlow as chargeable to the EDC development. The technical review concurs with this cost assignment but disagrees with 100% cost assignment of all northern connections to the Sand Creek Parkway. The technical team feels a 50% assignment would be more appropriate, as these roadways will provide various access points to the center of the former AMC from the Sand Creek Parkway. However, since the Parkway will not be completed until the later stages of the build-out, CERL used 100% in the CERL1 Scenario. Supporting cost estimate tables for roads are provided in Appendix C.

Storm water drainage system. The major FRA storm drainage system is in fair condition for the current AMC configuration. FRA proposes to add new storm water collection lines along South Hutton, Loop Road, South Van Valzah, Charlie Kelly, North Cooper, North 10th, by the wastewater treatment plant, and along sections of the Sand Creek Parkway. The storm water management plan also includes creation of a drainage swale through the golf course to direct water under the new 27th Street extension and the Sand Creek Parkway. Three retention ponds are planned north of the Sand Creek Parkway. The FRA estimate of **\$1,865,085** is slightly higher than the USACERL cost estimate range of **\$1,419,284** to **\$1,570,637**. The FRA's and USACERL's cost estimate calculations are contained in Appendix C.

USACERL need and extent findings for storm water drainage. USACERL conducted a condition assessment of the storm water system and interviewed the

maintenance supervisor for utilities Dave Wilcox, and Paul Davis, Chief, Operations and Maintenance. The findings were that the storm water conveyance system is in very good shape. The few problem areas are as follows:

1. A bottleneck was constructed in the large diameter pipe leading to outfall "A." Pipe diameter changes from 48 in. to 36 in. and then back to 48 in.
2. Poor surface drainage and culvert cause flooding of roads in the 300 area.
3. Pipes in the area immediately southeast of the hospital are too small to adequately drain the area.

The USACERL technical evaluation determined that the proposed scope of storm water management system improvements can be reduced to new lines in the Sand Creek Parkway and in the northeast area of the EDC area to address the poor drainage. The technical team also feels the retention ponds are not necessary and that the current contour of the golf course would provide adequate drainage. Therefore, USACERL feels the intent of the FRA cost estimate of **\$1,865,085** can be adequately met for between **\$1,258,895** and **\$1,374,480**. Appendix C tables support cost estimates for storm water improvements.

Domestic water distribution system. The major FRA domestic water system is currently in fair condition for the current AMC configuration. Water is being purchased from the City of Denver. The connection piping enters the installation on the west side, where the water flows to a 1,200,000-gal flow equalization and storage tank. Water is pumped from that tank into the Fitzsimons distribution system.

The distribution system is more than 50 years old and is failing. The primary cause of failure is corrosion damage to the interior of the cast iron pipes. The USACERL technical team concurs with the Chief of Operations and Maintenance who was of the opinion that the distribution system had very little value, and complete replacement could be justified. However, many valves and fire hydrants have been replaced in recent years and should be reusable.

The redevelopment plan calls for changing the water source for the Fitzsimons area from the City of Denver to the City of Aurora. Aurora can provide water at a greater flow and pressure, which will allow the existing flow equalization and pumping system to be abandoned, and still provide the necessary flow for fire protection.

The plan calls for replacement of the majority of the distribution system, except for selected sections of 8-in. pipe, which have been replaced. The plan for water system upgrades appears to be sound. The FRA estimate of \$1,087,575 falls within the USACERL cost estimate range of \$1,010,674 to \$1,118,200. The FRA's and USACERL's cost estimate calculations are contained in Appendix C.

USACERL need and extent findings for domestic water. The technical team concurred with the replacement of the entire water system. For the CERL1 Scenario, it is recommended that the existing 14-in. main that is just north of West Harlow be used as the main line. This line was replaced instead of placing a new 12-in. line along West Harlow as the redevelopment suggests. This design would also have the hook-up to the City of Aurora's water line occur at the existing pump station instead of the intersection of West Harlow and Peoria.

With this revision in the plan, USACERL feels the intent of the FRA cost estimate of \$1,087,575 can be adequately met for between \$1,011,055 and \$1,117,819. Supporting cost estimate tables for domestic water are provided in Appendix C.

Sanitary sewer systems. The major FRA sanitary sewer system is currently in good condition for the current AMC configuration. The majority of the waste-water collection and treatment system was constructed during the 1940s. There are many sections of newer sewer lines where subsequent development of the installation has occurred. Other newer sections are possible as well.

The sewage treatment plant, while generally in good condition, is being abandoned by the Army. The tertiary treatment lagoon at that plant is unlined and contains sediment contaminated with heavy metals. Also, one of the trickling filters has a swing arm with a mercury seal bearing. The lagoon and trickling filter are both identified as restoration sites. A project is active to construct a sewer main to bypass the plant and connect to a Metro Wastewater interceptor. The project also includes construction of a gray-water line to supply irrigation water for the golf course and demolition of the existing treatment plant.

The sewers were generally constructed without an adequate slope. The Fitzsimons Department of Public Works (DPW) has had to flush all sewer lines annually to remove solids buildup. Grease from the housing areas and the hospital was specifically mentioned as causing blockage problems. Otherwise, the sewer system seems to be in good condition. It is possible that pretreatment of the wastewater from the housing areas and hospital to remove grease could significantly reduce the maintenance requirements for the sewers.

Manholes inspected during USACERL's visit showed little or no evidence of deterioration, solids buildup, or surcharging. There was no evidence of widespread inflow/infiltration problems according to flow records at the sewage treatment plant. Plant operator Shari Matousek said that, during a recent severe rain event, flow to the treatment plant only increased about 0.2 million gallons per day. The City of Aurora is currently conducting a video survey of the sewers. Results of that survey should provide the most accurate assessment of the sewers. The manhole receiving wastewater from the hospital has a storm water bypass, which is known to discharge domestic wastewater during storm events. This bypass, and the cause for its need, must be eliminated.

The redevelopment plan estimates that only 10% of the existing sewer is reusable, and calls for construction of a new trunk sewer system. Certainly large portions of the system must be abandoned to avoid restrictions to redevelopment because of access requirements for maintenance. However, the plan does not provide an evaluation of alternatives to maximize reuse of the existing collection system. It is recommended that alternatives using a combination of trenchless technologies, lift stations and force mains, and pretreatment for grease removal be considered.

The FRA estimate of **\$768,892** is slightly higher than the USACERL cost estimate range of **\$609,621** to **\$664,078**. The FRA's and USACERL's cost estimate calculations are contained in Appendix C.

USACERL need and extent findings for sanitary sewers. Based on the onsite evaluation, the technical team feels the existing system could function adequately if two lift stations were installed. These actions coupled with grease pretreatment in the hospital and housing areas could allow for use of the existing system.

The technical team also feels that the connection of the two separate Link 1 projects on the Sand Creek Parkway and the two separate projects on the 23rd Street extension through the golf course could eliminate the need for the project to connect Sand Creek Parkway and the 23rd Street extension. The technical team also views the addition of the new line along North 4th and the replacement of the principal connector to the Sand Creek interceptor (line by the old wastewater treatment plant) as the only other requirement for a fully functional wastewater treatment plant.

With these revisions in the CERL1 Scenario, the intent of the FRA cost estimate of **\$768,892** can be adequately met for between **\$449,269** and **\$475,981**. Supporting cost estimate tables for sanitary sewer are provided in Appendix C.

Building demolition. The FRA proposes **\$10,552,000** in building demolition at Fitzsimons AMC as detailed in Table 7, Demolition Costs of the FRA Economic Development Conveyance (EDC) Application (FRA 1998). Cost assumptions upon which Table 7 were based and the building demolition lists that Table 7 contains were sufficient for USACERL to develop an independent demolition cost estimate. In comparison, the USACERL estimate for building demolition at Fitzsimons ranges between **\$4,748,000** and **\$8,007,000**.

While the FRA provided a detailed demolition cost estimate, Table 7 excluded an estimated 134,436 gross sq ft or 21% of buildings that will be required to be demolished in order to achieve planned development. Using the Fitzsimons Conveyance Plan (EDC, figure 8-4), subsequent changes to the Fitzsimons Conveyance Plan as identified by the FRA, the Fitzsimons Infrastructure Master Plan, and the U.S. Army Garrison, Fitzsimons, Building Information Schedule, USACERL was able to identify all buildings requiring demolition within EDC areas to accommodate infrastructure modifications and planned development. Using the current demolition requirement and the FRA cost assumptions for demolition, their application estimate needed to be increased by **\$1,765,984** to arrive at a total demolition price of **\$12,318,000**. In comparison, USACERL increased their estimate by **\$1,853,000** to arrive at a total demolition price range of between **\$6,601,000** and **\$9,860,000**.

While the total difference between these estimates is only about 23%, many adjustments had to be made to present an accurate comparison of demolition expenses. The first adjustment was the cost to remove lead-based paint. The U.S. Army Environmental Hygiene Agency has provided the Army with sampling protocol and procedures to remove and dispose of lead-based paint in facilities. By following the procedures in several pilot cases, it was found that the aggregate volume of the building demolition dilutes the amount of lead-based paint to the point where it falls below regulatory thresholds of hazardous waste. Therefore, it becomes regular demolition waste. (See also 57 Federal Register [FR] 958 and 57 FR 37194). With this information in mind, USACERL did not consider the removal of lead-based paint in its demolition analysis.

The second adjustment was in the actual buildings descriptions. USACERL found slight inaccuracies in the building information upon which the estimates were based. Inappropriate numbers of floors were used for some buildings, and crawl spaces were identified for others where none existed. To rectify this erroneous information, USACERL used the Building Information Schedule and the Real Property Inventory from the installation as they are the "official" Army records. In addition, USACERL found that the demolition list also included three buildings that have already been demolished.

The third adjustment was the evaluation of asbestos removal. The FRA used a unit cost to remove asbestos from an entire building. This estimate was then increased by the amount necessary to remove asbestos from the crawl space. USACERL used more accurate information provided by the installation from an asbestos survey. From this information, USACERL determined the types and quantities of asbestos to be removed and developed a cost estimate, which was incorporated into a total demolition cost.

Bioscience park improvements. In addition to the major property-wide infrastructure improvements reviewed and evaluated above, the bioscience park development is programmed for roadway and utility extensions totaling \$4.5 million and spanning 133 acres. The costs for extending infrastructure to service the park are as follows:

- \$16,000/acre – roads
- \$4,000/acre – steam
- \$6,000/acre – domestic water
- \$3,500/acre – sanitary sewer
- \$4,000/acre – storm water.

The FRA estimate of \$4.5 million falls within the USACERL cost estimate range of \$3.9 to \$4.5 million. The low end of the range represents bioscience park improvement costs for 133 acres without steam line extensions. The high end represents the FRA proposal.

USACERL need and extent findings for bioscience park improvements. Although it is the opinion of USACERL that in-tract infrastructure for the golf course area, which represents Phases 3 and 4 of the bioscience park, is necessary to attract quality users, the FRA likely overstates potential acreage. USACERL's independent measurements of Phases 3 and 4 indicate that only 119 acres would be applicable for the type of infrastructure extensions contemplated by the FRA. When 119 acres is considered, total bioscience park costs decrease to \$4.0 million.

In addition to the potential acreage discrepancy, USACERL also noted that the inclusion of steam line extension costs is internally inconsistent. The FRA business plan assumes that the central heating plant will be decommissioned 2 yr after the EDC, thus suggesting that steam line extensions into the bioscience

park would be unnecessary and unjustified from a technical review standpoint. Correcting this apparent error, USACERL estimates that total likely bioscience park costs total **\$3.5 million**, which is \$1.0 million below the FRA estimate of \$4.5 million.

Heating systems. The key uncertainty of the capital improvement plan lies in the future of the central steam plant. The existing steam plant was completed in 1996 and is completely state-of-the-art and in excellent condition. According to the FRA, it is probably only economical to operate when heating at least 2 million sq ft. Additionally, the FRA believes that, in the early years with lower utilization levels, the operating cost of the plant will have to be subsidized.

If the FRA had to close the existing plant and build another one for the university, a large capital cost of somewhere around \$21.7 million will have to be incurred. Because of considerable uncertainty about the steam plant, USACERL conducted a detailed analysis of these issues.

System history. The central heating plant at Fitzsimons consists of four boilers capable of producing a total of 210,000 lb/h of 200 psig steam. The current operation supplies 125 psig steam to the distribution system. Three of the boilers have a maximum capacity of 60,000 lb/h each, and the fourth boiler has a capacity of 30,000 lb/h. The primary fuel burned in the boilers is natural gas. The boilers are also capable of burning #2 oil. The plant was completed in 1996 and is in excellent condition. The plant operators maintain a rigorous schedule of preventive maintenance and water treatment that should enable the boilers to last well more than 30 yr.

Most of the distribution system has been replaced within the last 15 yr, and many older sections could be capped or retired to reduce losses and increase reliability even further once the buildings scheduled for demolition have been razed. Again, the good condition of this distribution system is due to the aggressive maintenance, replacement, and water treatment programs in place at Fitzsimons. As is common in heating plants with this type of proactive operation and maintenance program, this system should last 30 yr or more.

Proposed reuse. The Fitzsimons Infrastructure Master Plan recommends the long-term reuse of the heating plant to provide heating service to the UCHSC campus and eventually to customers in the Bioscience Research Park. In addition, a report completed by Stanley Consultants for the U.S. Army Center for Public Works (CPW) recommended conveyance of the plant to the FRA in its present condition. Conversely, the FRA has proposed the short-term use of the heating plant while existing facilities are converted to individual heating

systems and a new central heating plant constructed within the area conveyed to the UCHSC. They also have requested Army assistance in operating and maintaining the plant for 2 yr after closure (until the individual building systems are completed).

USACERL need and extent findings for heating. Of all the steam distribution system types, aboveground systems have proven to be the most reliable and sustainable. Trench systems are slightly more expensive than aboveground piping systems in terms of maintainability because of extra time spent during repair work for removal and replacement of the trench covers. Initial cost is often the determining factor in choosing aboveground systems over trench systems, since trench systems are typically more expensive to install. The distribution system at Fitzsimons is mostly a combination of aboveground and trench piping that has been replaced over the last 15 yr. Inspections of the pipe where visible in manholes, at the new central heating plant, and at the old plant revealed that the system is generally in good condition, though some improved insulation may be needed where some insulation damage has occurred during repairs. Of approximately 2,400 linear feet (LF) of steam piping between the new heating plant and Building 500, there is a section of about 1,300 LF of new aboveground piping and a section of about 600 LF of trench piping that was replaced in 1994. The remainder of the piping (about 500 ft) between the new heating plant and Building 500 is reportedly in good condition.

The heating plant data indicate that the system has relatively low losses and is performing better than many of the systems at DoD installations that USACERL has studied. The heating plant should be able to provide cost-effective steam and hot water and relieve the occupants of the burden of investing in decentralized systems in the early stages of redevelopment if the buildings to be occupied in the short term remain on the existing steam and hot water systems. Given that the system is performing well, is in relatively new condition, and is rigorously maintained, it is expected that this system will last more than 30 yr. USACERL expects that the central heating plant will draw serious interest from third-party energy suppliers if UCHSC does not request ownership of the plant.

Creation of a new plant nearer to the UCHSC campus has many drawbacks. One is the need for air pollution permitting of new boilers. Health and safety are also major concerns. The existing plant is ideal from a health and safety standpoint because the flue gases are not likely to be drawn directly into any of the buildings, which would create a hazard for building occupants, due to its remote location. It is extremely important to ensure that the outside air drawn into the health clinic and the other campus buildings is actually fresh air. If a new plant were to be built, it should be located with prevailing winds and local

air flow under strong consideration. Exhaust gases from the central heating plant should not be released upwind of tall, occupied buildings. Locating the plant near the campus would probably require a very high chimney to ensure that exhaust gases are not drawn into occupied spaces. Also, danger to campus personnel and students in the event of an explosion from a boiler failure or a gas main leak is greatly reduced by the remote location of the existing central heating plant.

To check the need and extent of using the existing heating system, USACERL used the HEATMAP program. USACERL developed two different scenarios to test the sensitivity of using the heating system. One scenario was to use the existing system "as-is" (referred to as "Existing Steam System"), and the other is to abandon the system and construct a new one. The results of these scenarios follow.

Existing steam system. Building category codes and building loads were estimated by entering the actual square footage of each building reported in the Fitzsimons redevelopment plan. USACERL used the climate data for Denver, CO. Costs for this option are summarized in Table 5.4.

Table 5.4. Existing steam system HEATMAP data.

Peak Building Load (MBtu/h)	42.2
Annual Building Load (MBtu/yr)	49,772
Peak Plant Steam Load (MBtu/h)	50
Annual Plant Fuel (MBtu/yr)	126,160
Annual Fuel Cost (\$)	\$403,712
Annual Operating Cost – Labor(\$)	\$391,261
Piping Repair Cost (\$/yr)	\$62,000
Plant Electrical Cost (\$/yr)	\$9,494
Annual Equipment and Supplies (\$)	\$95,579

The system loss for the distribution system is assumed to be around 8.4 MBtu/h for the entire study period, since the system is in good condition. The effect of the system loss is felt throughout the heating season. At part load conditions, the system loss will be nearly the same as during peak load conditions.

The total annual operating cost, derived from the data in Table 5.4, would be approximately \$962,046. Division of the total annual operating cost by the annual demand (from HEATMAP), of 90,425 MBtu yields a cost of \$10.64/MBtu for steam.

Campus steam system. This option was used to estimate the cost of adding new distribution piping from a new heating plant to the area where new campus buildings are planned to be constructed. HEATMAP calculated the size and cost

of a new shallow trench piping system from the existing plant to serve Building 500 and four other “proposed” buildings in the proposed campus area. Three of those proposed buildings were 167,000 sq ft and the fourth was 50,000 sq ft. The piping system layout coincides with that proposed in the Fitzsimons redevelopment plan. Pipes meant to serve existing structures or other areas of the redeveloped site were not added. Costs for this option are summarized in Table 5.5.*

Table 5.5. Campus system cost estimate.

New Shallow Trench Piping System (\$)	\$3,285,724
New Heating Plant (\$)	\$8,070,000
Peak Building Load (MBtu/h)	15
Annual Building Load (MBtu/yr)	32,934
Peak Plant Steam Load (MBtu/h)	19
Annual Plant Fuel (MBtu/yr)	50,932
Annual Fuel Cost (\$)	\$162,984
Annual Operating Cost - Labor(\$)	\$157,703
Plant Electrical Cost (\$/yr)	\$7,653
Annual Equipment and Supplies (\$)	\$164,870

USACERL expects that the central heating plant will draw serious interest from third-party energy suppliers if UCHSC does not request ownership of the plant. A third-party supplier would be able to operate the facility and sell steam to the existing customers as well as serve future customers in an economical manner. Private or university operation of the existing system to serve present and future thermal energy needs provides the best option for the EDC. It would not be desirable for the Army to operate and maintain the plant for 2 yr after closure of the facility. Since the heating plant is new and the distribution system is performing well, it is reasonable that experienced operators and maintenance personnel from the university or a third party could immediately assume operation of the plant. Central heating systems have been known to last more than 30 yr with correct water treatment. If the buildings on the steam system can be occupied with tenants, the steam system should be able to provide cost-effective heat and hot water and relieve the occupants of the burden of investing in decentralized boilers and furnaces.

Building renovation. Considered in this chapter also are building fit-up cost estimates, which are reflected in Table B1 of the Business Plan Review.

* The available detailed estimates for the costs, the system flow analysis, the consumer load summary, and the pipe inventory report from HEATMAP are available by request to USACERL (PL-N).

USACERL calculated renovation costs using a combination of different *RS Means* manuals. Renovation cost estimate considerations were limited to Building 628 as it was the only building proposed in the FRA business plan for building fit-up. However, cost estimates were developed by USACERL for Building 262, as onsite coordinated inspections indicated potential fit-up requirements, but these estimates were not reflected in the CERL1 Scenario. Renovation expenses for the balance of buildings were not considered necessary and excluded from FRA estimates as the remaining buildings are to: (1) be retained in their current function and therefore have no or limited renovations costs, (2) be transferred to others with renovations cost responsibility transferred to the new owners, (3) serve only in an interim capacity, in which case renovations should be limited or unnecessary, or (4) be demolished.

FRA plans indicate that Building 262 will be leased as a medical laboratory and that Building 628 will continue to function as an optical fabrication lab. USACERL's renovation cost estimate for Building 262 is based on modifications necessary to convert the building from office administrative use to that of a medical laboratory. These modifications include replacement of interior partitions, replacement of interior finishes, installation of new mechanical equipment (HVAC,* electrical, and plumbing upgrades), and installation of laboratory cabinetry and workstations. The USACERL technical team estimated fit-up costs for Building 262 of \$586,000. With 25 and 50% contingencies, these costs could rise as high as **\$732,000** or **\$879,000**. While these costs are high, this estimate takes into consideration the extensive mechanical upgrades that will be required for conversion from office to medical laboratory use.

USACERL's renovation cost estimate for Building 628 is based on "marketability" fit-up (cleaning, painting, replacement of damaged ceiling/floor tiles, and the partial replacement of laboratory equipment). The fit-up cost for Building 628 was estimated at \$331,000. With 25 and 50% contingencies, these costs would range between **\$413,000** and **\$496,000**. These costs compare to an FRA estimate of \$452,600; and this is found to be reasonable. A complete breakdown of cost assumption is provided in Appendix C. Table 5.6 shows the estimated fit-up costs.

* HVAC = heating, ventilating, and air-conditioning.

Table 5.6. Estimated fit-up costs.

Building	628		262	
	USACERL	FRA	USACERL	FRA
Occupancy	132	169	73	78
Square Feet	20,227	25,891	11,162	11,900
Total Cost	\$330,631	\$452,600	\$585,678	\$0.00
Cost/Square foot	\$16.35	\$17.48	\$52.47	\$0.00
Contingency	\$413,289	\$565,750	\$732,098	\$0.00
Cost/Square foot	\$20.43	\$21.85	\$65.59	\$0.00
Contingency	\$495,947	\$678,900	\$878,517	\$0.00
Cost/Square foot	\$24.52	\$26.22	\$78.70	\$0.00

Conclusions

The independent cost evaluation of the proposed scope of the FRA proposal of **\$23.0 million** determined a more appropriate cost estimate would range between **\$15.0 million** and **\$19.7 million**. Under the CERL1 Scenario, estimated infrastructure improvement costs necessary to accomplish the desired infrastructure improvements more likely range between **\$14.0 million** and **\$18.0 million**. Using the CERL1 Scenario could produce a cost savings range of between **\$5.0 million** and **\$9.0 million**. This finding suggests that the FRA's infrastructure improvement costs are slightly above USACERL's range of reasonableness. However, USACERL feels that the degree of what falls outside the range of reasonableness is small and, therefore, the capital improvement costs should be considered reasonable. As mentioned earlier, FRA used a combined contingency and soft-cost factor of 44% to USACERL's range of 10 to 30%. This 14% higher factor could be considered the sole cause for their values to exceed USACERL's estimates. USACERL further develops this finding in Chapter 4, **Business Plan Review and Market and Financial Feasibility Analysis** through the CERL1 Scenario.

USACERL expects that the central heating plant will draw serious interest from third-party energy companies to operate the facility and sell steam to the existing customers as well as serve future customers in an economical manner. Since the heating plant is new and the distribution system is performing well, it is reasonable to expect that the system can last more than 30 yr. If the buildings on the steam system can be occupied with tenants, the steam system should be able to provide cost-effective heat and hot water and relieve the occupants of the burden of investing in decentralized boilers and furnaces.

6 Extent of State and Local Investment and Risk

Prepared by:

Jeffrey J. Bogg, Community Planner
USACERL, ATTN: CECER-PL-N
P.O. Box 9005
Champaign, IL 61826-9005
(217) 352-6511

Background

Local investment in the redevelopment of Fitzsimons AMC will involve significant development costs, including high capital expenditures that arise mainly from site and utility improvements. The EDC application estimates total infrastructure costs of \$23.0 million (1998 dollars) programmed in four phases, which are projected to be met through supportable real estate revenues (\$83.8 million). In addition to real estate revenues, the applicant has identified potential financial commitments from the U.S. EDA, the DoD OEA, the State of Colorado, and the City of Aurora.

Given the capacity of the Fitzsimons redevelopment effort to generate revenue and proposed fiscal packaging, it is USACERL's opinion that the FRA EDC business plan stands a reasonable probability of achieving financial feasibility and job-creation goals.

Approach

USACERL will discuss the extent of state and local investment risk associated with the redevelopment of Fitzsimons AMC, as well as the ability of the FRA to implement the January 1997 Reuse Plan as proposed in the EDC application.

Operational Investment and Risk

Investment

According to the FRA, the business plan pro forma effectively projects adequate revenues of \$83.8 million from real estate and OEA sources to offset operational expenditures of \$28.2 million throughout the 25-yr redevelopment period.* This results in a 25-yr cumulative *positive* net operating cash flow of \$55.6 million, which is dedicated to capital improvement programming. The proposed level of operational investment is substantial, but in most cases is a prerequisite for the successful redevelopment of Fitzsimons because of the need to maintain a competitive bioscience park and to accommodate the unique business life-cycle requirements of park users and tenants.

Risk

The FRA's operational investments attempt to ensure that adequate resources will be available to meet the short- and long-term challenges of marketing the property to bioscience companies and instilling in developers the necessary level of confidence to invest in Fitzsimons. Operational risk is associated with the capacity of the site to generate revenue, otherwise known as market risk. As long as Fitzsimons generates sufficient revenues to offset required operational expenses, risk is somewhat reduced. However, as USACERL noted in Chapter 4, **Business Plan Review and Market and Financial Feasibility**, the average operating expense ratio for the first 2 yr of development is 114% and begins at over 121% in Year 1.[†] Despite these forecasts, operating expense ratios decline over time as a result of increased revenues, although operating expenses grow at over 4% per year. Thus, as with any other large-scale development project, the greatest degree of operational risk exists within the early phases of development when revenues are nominal and operating expenses are high in an attempt to effectively market and manage the property.

Some factors that keep the FRA's operational risk within manageable limits include the potentially synergistic relationship with UCHSC, and the early

* Note that all figures presented from here on will be expressed in inflated dollars as opposed to current 1998 dollars.

[†] The operating expense ratio is a real estate performance measurement that simply divides total operating expenses by effective revenues. Generally, lower ratios connote more efficiently managed income producing properties and, in turn, a greater capacity to generate net operating income (NOI).

presence of bioscience tenants such as Myogen, Inc. and Western Nutriceuticals, Inc., who seek to locate and expand operations at the site because of affiliations with UCHSC. In addition, USACERL demonstrated in Chapter 4 that the proposed 60,000-sq ft bioscience incubator is a prerequisite for a successful university-related bioscience park. Finally, the FRA's executive director, Robert Olson, has had previous experience in bioscience park management in Virginia.

However, the level of operational risk borne by the FRA should not be underestimated. By virtue of the proposed bioscience reuse, operational risk increases in relative terms to other potential reuse scenarios such as for standard light industry. Bioscience as an industry is notoriously volatile because of ebbs and flows in financing, Food and Drug Administration approvals, protracted product development timelines, and a research environment marked by the pronounced uncertainties of a pioneering industry. Moreover, the Fitzsimons area will be competing with established bioscience corridors such as Boulder County and other developments that may offer more favorable real estate pricing (e.g., Lowry). To overcome these operational risks, the FRA must work closely with UCHSC and hone its marketing program to ensure that potential start-ups and UCHSC-affiliated companies are aware of the benefits of locating at Fitzsimons, and remaining there once they grow.

Capital Improvements

Investment

Chapter 5, Need and Extent of Proposed Infrastructure Improvements, provides an indepth discussion of the FRA-proposed development infrastructure program provided in the EDC application and reflected in the business plan pro forma. To summarize, the FRA proposes the following major improvements (in inflated dollars):

- \$5.9 million in road upgrades and new road construction
- \$2.6 million in storm water improvements
- \$1.4 million in domestic water upgrades and new system construction
- \$1.0 million in sanitary sewer upgrades and new construction
- \$13.6 million in building demolition
- \$6.7 million in bioscience park specific improvements.

In total, the FRA proposes nearly \$32.1 million in infrastructure development costs.

USACERL was unable to independently verify total project infrastructure costs, although some individual improvements were found to fall within USACERL's estimated range of cost reasonableness. USACERL-estimated infrastructure costs under the CERL1 Scenario total \$25.8 million, over \$6.3 million below the FRA estimate. The largest discrepancies were found in demolition, roads, and storm drainage expenditures.

Although USACERL challenges the FRA's proposed need and extent of development costs, USACERL finds the timing of these improvements to be prudent and reasonable given that a 25-yr planning horizon is contemplated. Phased improvements in the early years of redevelopment will primarily improve site transportation access, domestic water capacity, and sewer capacity. Also, the FRA, in conjunction with UCHSC, plans to reuse the existing Army infrastructure at Fitzsimons to the maximum extent practicable.

The FRA has proposed to finance these capital improvements through real-estate-related revenues. Assuming the FRA's projected 25-yr revenues of \$83.8 million and operating expenses of \$28.2 million, nearly \$55.6 million in operating cash flow remains for development costs of \$31.4 million. This results in a 25-yr cumulative cash flow surplus of *positive* \$24.3 million.

Risk

The amount of investment and risk is indeed substantial, as evidenced by the FRA's proposed commitment to underwrite a substantial amount of project risk by absorbing nearly \$31.4 million in estimated infrastructure costs. The ability of the FRA to develop a quality bioscience park that attracts end users over the long term, rests in part with required infrastructure investment that brings Fitzsimons to marketable, code compliant, and functional standards. Accordingly, infrastructure risk rests with the fiscal capacity of the FRA and the revenue generating capability of the Fitzsimons EDC reuse effort in general. Market analysis has demonstrated a potentially reasonable stream of demand for bioscience park real estate products, so the risk associated with completed infrastructure improvements and insufficient park end-user demand is somewhat abated.

To reduce downside risk exposure, the FRA has judiciously phased infrastructure improvements in the early years of redevelopment, programming only \$3.1 million of the total \$31.4 million (10%) in the first 5 yr and \$14.3 million (55%) in the first 10 yr of redevelopment. This strategy prevents the FRA from over-investing in development infrastructure before the market for bioscience park property is well-defined. Also, the FRA is attempting to diversify infrastructure

investment risk through external financing sources such as the EDA,* tax increment financing (TIF), State of Colorado and City of Aurora support, and bonding of lease revenues. Therefore, USACERL concludes the probability is relatively high that programmed infrastructure improvements will be completed in a timely manner and in concert with market demands, given the FRA's phasing strategy, the anticipated revenue stream to directly fund improvements, and potential external sources of debt and grant financing.

Conclusions

The level of investment and scope of redevelopment observed at Fitzsimons is substantial, totaling nearly \$59.6 million. The FRA has outlined an investment strategy that soundly accommodates job-creation goals while simultaneously reducing operating and infrastructure investment risks, in spite of an inherently risky bioscience reuse. USACERL's CERL1 Scenario improves the prospects for risk management and financial feasibility through independently supportable assumptions that improve 25-yr cash flows. Nevertheless, this level of investment should be looked upon favorably by the Army in negotiating the final terms and conditions of the transfer agreement.

* The FRA has already requested a \$6 million grant for the construction of the bioscience incubator. Additional requests will be made to cover annual shortfalls arising from development infrastructure expenditures.

7 Local and Regional Real Estate Market Conditions

Prepared by:

Shawn R. Hill, Community Planner
USACERL, ATTN: CECER-PL-N
P. O. Box 9005
Champaign, IL 61826-9005
(217) 352-6511 x6307

Methodology

In an attempt to provide an overall perspective of the development environment in the Denver Metropolitan Region, USACERL gathered general demographic and employment data for the region from a variety of sources. To comprehensively assess the market analysis provided within the Fitzsimons EDC Application and Reuse Plan, USACERL analyzed local and regional residential, office, and industrial real estate market data. Real estate market data were collected from real estate research firms, Urban Land Institute "Market Profiles," government studies conducted in conjunction with BRAC initiatives, interviews with local real estate brokers, as well as other referenced sources. The independently gathered data were used, in part, to confirm or dispute claims made in the EDC Application and Reuse Plan related to real estate conditions, impacts due to base closure, and anticipated economic redevelopment from an EDC.

Background

As part of the process of evaluating the Denver Metropolitan Region and local submarkets, USACERL examined the area surrounding the EDC parcel, the location and characteristics of the regional submarket relevant to Fitzsimons, and recent regional economic and demographic trends.

Site Configuration

The former Fitzsimons site consists of 577 acres in the southwest portion of Adams County, CO, just east of the Rocky Mountains. Specifically, the installation is approximately 8 miles east of downtown Denver in the northern portion of the city of Aurora, CO.

At the time of the BRAC 95 recommendation, there existed 294 buildings on 289 acres of installation property, 142 acres of improved grounds (e.g., golf course), and 146 acres of unimproved grounds that were neither landscaped nor maintained.* The primary land uses on the site included medical, administrative, industrial, commercial, residential, and recreational uses.

Access

The Fitzsimons site has good access to population and commercial centers in both the city and the surrounding region, as it is well served by regional expressways and arterial streets. Principal highways near Fitzsimons are Interstate 70 (I-70) 1.5 miles to the north and I-225, which parallels the eastern boundary of the installation. East Colfax Avenue (U.S. Highway 40), a principal East/West commercial artery, services the southern entrance and provides direct access to downtown Denver via an I-225 exit. East Colfax Avenue is the only East/West arterial that is continuous throughout the surrounding area and generally services traffic volumes in excess of 30,000 average daily trips (ADT). The western property boundary is marked by Peoria Street (State Highway 85), a major North/South urban arterial with direct access to I-70. The East Gate is served by Potomac Street, which is an urban arterial south of the East Colfax Avenue intersection. Finally, Montview Boulevard, a major East/West arterial with access to downtown Denver, intersects Peoria Street just south of the West Gate. All of these roadways are in good condition.

In addition to convenient street access, the Fitzsimons site is served by a park-and-ride bus station operated by the Regional Transportation District; bus stops 15 and 20 are located directly on site. Although the installation property itself has no runways, the newly completed Denver International Airport (DIA), which is the major passenger and cargo airport in the region, is just 5.5 miles from the

* Refer to Fitzsimons FEIS, p 4-2.

Fitzsimons site. In addition, four other air facilities that are designated DIA relievers are located within 10 miles of the site.

Contiguous Land Uses

The City of Aurora is highly developed and can be characterized by a variety of land uses, including residential, commercial, and small amounts of light industrial use. Major roadways bound Fitzsimons on three sides, as well as an undeveloped community park, which helps to buffer the site from contiguous land uses. Several blighted residential neighborhoods are within the immediate vicinity of Fitzsimons. Nearby residential neighborhoods include the Morris Heights subdivision, due north of contiguous Sand Creek Park; the Hoffman Heights subdivision to the south; the Altura subdivision, east of I-225; and Boston Heights to the west. Other nearby developments, which include gas stations, commercial strip centers, dry cleaners, restaurants, apartment complexes, a mobile home park, and office buildings, exist to the west and south along Peoria Street and East Colfax Avenue, respectively. Finally, a major area zoned for or developed by light industrial uses is located roughly 2 miles northeast of Fitzsimons, and a second major industrial area is approximately 7 miles southeast of the EDC parcel.

Market Analysis

In an attempt to provide a general analysis of the Denver Metropolitan Regional market, USACERL examined the state of the local commercial real estate market. The reuse of the Fitzsimons facility is largely focused on bioscience research. Accordingly, particular emphasis was placed on this market segment. However, given the unique characteristics of such an exclusive industrial market, as well as its particular relevance in relation to the success of the overall redevelopment plan, USACERL's analysis of the bioscience industry was explicitly presented in Chapter 4, **Business Plan Review and Market and Financial Feasibility Analysis**. Thus, the remainder of this chapter will focus specifically on the condition of the local market for residential, office, industrial, and recreational uses.

The Denver Economy

The Denver metropolitan economy has made a stunning transition throughout the last decade, a time period that has been marked by continuing growth and exceptional strength. Historically, Denver's economy had depended on resource-intensive industries and exhibited little diversification. Alternatively, the

current base economy of metropolitan Denver is marked by the emergence of high-technology manufacturing and service industries, which include telecommunications service providers, aerospace engineering firms, and computer software manufacturers. In the decade since 1987, metropolitan Denver has averaged 35,000 new residents and 28,000 new jobs each year, seen its unemployment rate cut in half (to 3.5%), and its overall office vacancy rate drop from 30 to 12.7%.*

General State of the Regional Real Estate Market

Driven by low inflation and interest rates, the real estate market in the Denver Metropolitan Region is exceptionally tight and has made a solid comeback from its recession of the 1980s. Healthy sales and leasing activity, continuing positive absorption, and exceptionally low vacancy rates all are evidence of the overall strength of the commercial market. Spurred by the insatiable demand for investment properties by Real Estate Investment Trusts (REITs) on the equity side and through Commercial Mortgage Backed Securities (CMBS) on the debt side, the overall demand for investment real estate in the Denver Metropolitan Region approached record levels in 1997. Overall, a healthy economy, low interest rates, rising rents, increasing occupancy levels, and positive net absorption evidence the renewed investor interest and general health of the regional real estate market in metropolitan Denver.

Residential Market Summary

The residential housing market in the Denver metropolitan area has exhibited steady growth throughout the past decade, a trend that the City of Aurora has followed. While single-family permits dominated the time between 1990-1995, the growth and development of multi-family units have characterized recent years. Overall trends are marked by low vacancy rates, continued positive absorption, and high sale prices per square foot and per unit. The current future outlook for the residential market remains positive, especially with respect to the multi-family market.

Continued success of the I-70 corridor, combined with the anticipated access to Aurora that will be provided by the second segment of the I-470 project, are contributing to the accelerated residential growth in the Aurora submarket.

* Statistics taken from Grubb & Ellis, *Real Estate Forecast 1998 – Denver*.

Accordingly, a substantial amount of land in Aurora is zoned for future residential development, and a large number of planned residential developments are underway.

Office Market Summary

Overall, the office market in the Denver metropolitan area is very tight and has exhibited strength and stability throughout recent years. As of year-end 1997, the aggregate office inventory for the Denver metropolitan area included slightly more than 69 million sq ft of leaseable space. More specifically, the Aurora submarket consisted of roughly 4 million total sq ft of developed office space, only 9.5% of which remained vacant; however, note that net absorption for the year was negative. Table 7.1 is an overview of the 1997 trends for the Aurora and Airport/Montbello office submarkets.* Figure 4 (p 25) shows the office submarkets.

Table 7.1. 1997 Office Market Overview.

Submarket	Rentable Square Feet ^a	Vacant Square Feet ^b	Percent Vacant (%)	YTD Net Absorption	Square Feet Under Construction	Average Asking Lease Rates ^c (\$)	
						Class A	Class B
East (Aurora)	4,132,034	392,543	9.5	(15,885)	0	17.58	14.77
Airport/ Montbello	677,369	149,699	22.1	2,443	160,000	17.94	12.26
Total Metro Area	69,378,317	6,151,090	8.9	1,420,371	1,247,746	19.61	15.27

*Includes multi-tenant buildings over 30,000 sq ft.

^b Does not include sublease space.

^c Based on Full Service Gross (FSG) pricing.

The increasing popularity of office "flex" space implies that a greater amount of future office demand will likely be seen in business/industrial parks. As recognized by the reuse plan, Fitzsimons does have a significant number of marketable office-type buildings that are suitable for long-term reuse. Given that average gross lease rates for Class B office space are on the order of \$13/sq ft,[†] USACERL confirms the FRA's finding that back office users will be attracted to the site at below market rents in the \$5 to \$8/sq ft range.

Finally, given recent trends throughout the region, the continuation of a healthy office market in the Denver metropolitan area is expected through the next several years.

* Taken from Grubb & Ellis, *Real Estate Forecast 1998 – Denver*, p 5.

[†] Ibid.

Industrial Market Summary

Driven by the strength of the regional economy and the availability of modern municipal infrastructure to support new development, the industrial market in the Denver metropolitan area is continuing to experience sustained growth. Despite the millions of square feet of newly constructed industrial space that has flooded the market in recent years, Denver boasts one of the nations lowest industrial vacancy rates – just 4.8% as compared to the national average of 8.3%.^{*} The rapid development of industrial property is expected to continue in the near future as REITs and other sources of exogenous capital continue to identify attractive redevelopment and investment opportunities in this thriving market. Figure 4 (p 25) shows the industrial submarkets.

The Fitzsimons site offers a unique location within the Aurora submarket given its proximity to the larger Airport/Montbello submarket to the north. Although the Aurora submarket is the region's smallest at slightly more than 2.2 million sq ft of space, the Airport/Montbello submarket contiguous to the northern border of the Fitzsimons site is the region's largest and most active, with more than 54 million sq ft of industrial space. In addition, the Fitzsimons site offers convenient access to the I-70 corridor and newly constructed DIA, both of which are in the Airport/Montbello submarket. Hence, USACERL feels confident that redevelopment opportunities at the Fitzsimons site can be competitively marketed in both the Aurora and Airport/Montbello submarkets. Table 7.2 gives an overview of the 1997 trends for the Aurora and Airport/Montbello industrial submarkets.[†]

Although Fitzsimons faces substantial competition from larger sites better located for traditional industrial development, given the strength of the regional industrial market, USACERL supports the FRA's finding that Fitzsimons can successfully compete for a share of the industrial tenants attracted to existing facilities with reuse potential at below market rates. More specifically, given that the average asking lease rates for standard industrial and flex space are on the order of \$4 and \$6/sq ft, respectively, USACERL confirms the FRA's finding that industrial tenants will be attracted to the site at below market rents in the \$2 to \$5/sq ft range.

* Taken from Grubb & Ellis, *Real Estate Forecast 1998 – Denver*, p 6.

† As reported by Grubb & Ellis, *Real Estate Forecast 1998 – Denver*, p 7.

Table 7.2. 1997 Industrial Market Overview.

Submarket	Total Square Feet ^a	Vacant Square Feet ^b	Percent Vacant (%)	YTD Net Absorption	Square Feet Under Construction ^c	Average Asking Lease Rate ^d (\$)	
						Standard Industrial	Flex
East (Aurora)	2,278,188	13,669	0.6	16,695	0	4.82	5.91
Airport/ Montbello	54,011,452	3,132,664	5.8	1,256,533	1,000,000	3.65	4.18
Total Metro Area	159,826,222	7,677,513	4.8	2,559,794	2,022,840	4.32	7.58

^a Includes single and multi-tenant buildings over 10,000 sq ft.

^b Does not include sublease space.

^c Includes speculative and build-to-suit construction.

^d Based on NNN pricing.

Retail Market Summary

Tight competition and continued new development characterize the retail market in the Denver metropolitan area. Driven by an increasing population, and complimented by the expansion of roadways and other municipal infrastructure networks, new retail markets continue to emerge, forcing existing retail centers to compete for established local tenants and newly entering national "big box" firms.

Given the competitive nature of the local retail market, the potential for retail development on the Fitzsimons site is somewhat limited. As a result of the blighted nature of the surrounding residential communities, many prospective retail tenants will likely find alternative emerging markets to be more attractive. However, land-intensive retail tenants or those desirous of interstate access may find the Fitzsimons site appealing. In addition, as future redevelopment and reuse of the Fitzsimons site intensifies, a critical mass of employment activity may induce an increased demand for neighborhood-serving retail uses.

Recreational Reuse Potential

The major recreational amenity that the Fitzsimons redevelopment could potentially market is the par 72, 18-hole golf course. Built on 130 acres, the 6,550-yd course is short compared to other mature and newly developed courses throughout the metropolitan area. Although the course is functional and has maintenance utilities in place, it is generally in poor condition compared with other public courses in the market in which it would be competing. According to

USACERL sources, the course needs approximately \$750,000 worth of capital improvements to make it competitive with other local public courses.*

In general, public golf courses in the local area with similar amenities average 68,800 rounds played per year at roughly \$17 per round. In addition, most courses offer carts at an average of \$20 per round. Given that golf is generally a stable, competitive industry, USACERL feels that the improvements proposed by the FRA business plan are sufficient to warrant the competitive public marketing of this facility. For further discussion, refer to Chapter 4, **Business Plan Review and Market and Financial Feasibility Analysis.**

Conclusion

In general, USACERL confirms the market analysis and findings presented in the FRA's Reuse Plan and EDC Application. Driven by the strength of the regional economy, the availability of modern municipal infrastructure to support new development, and other contributing factors, the real estate market in the Denver metropolitan area is continuing to experience sustained growth. The Fitzsimons site offers a unique location within the Aurora submarket given its proximity to DIA and larger Airport/Montbello submarket to the north. Thus, although Fitzsimons faces substantial competition from alternative development sites, given the current strength of the regional market, USACERL supports the FRA's finding that Fitzsimons can successfully compete for an adequate share of tenants if the existing facilities are marketed at below average market rates.

* As per the golf course appraisal completed by Bowes and Company.

8 Army Disposal Plan, Other Federal Agency Concerns, and Other Property Disposal Authorities

As part of the EDC application review process adopted by the BRAC office at HQUSACE and presented at the Corps of Engineers Real Estate Workshop in Denver, CO, in December 1995, USACERL has been asked to defer comment on these issues to the Real Estate Directorate at HQUSACE and the Corps of Engineers District, Omaha. In addition, both the negotiation process leading up to the submittal of the formal EDC application and review of the legal environment related to real and personal property disposal are beyond the scope of USACERL's technical review.

Future EDC reviews will continue to explore these issues insofar as they pertain to other elements of the technical review. Summaries of USACERL's findings on these matters will be documented when appropriate and when requested by Army decision-makers.

9 Economic Benefit to the Federal Government

Prepared by:

Jeffrey J. Bogg, Community Planner
USACERL, ATTN: CECER-PL-N
P.O. Box 9005
Champaign, IL 61826-9005
(217) 352-6511

Introduction

One of the criteria for EDC applicant eligibility that may be considered by the military department is the economic benefit to the Federal Government that will be derived from the proposed EDC. The military department is asked to consider the protection and maintenance cost savings that would be avoided by a swift conveyance of the EDC parcel, as well as the anticipated consideration from the transfer. In the EDC application for Fitzsimons AMC, the FRA has requested the EDC parcel for \$1 million. In addition, the applicant argues that, by rapidly assuming responsibility for the Fitzsimons property, the Army may realize substantial operations and maintenance cost savings. In an attempt to independently evaluate these claims, USACERL calculated the one-time layaway costs and annual maintenance and repair (M&R) costs associated with "mothballing" the facilities in the absence of an EDC. Also discussed is the potential consideration for the property that could be defended in a negotiated arrangement.

Conclusions

Layaway and Annual M&R Cost Savings

Without a timely conveyance of the 332-acre EDC parcel after all Army uses for the property cease, USACERL assumed that the Army would be compelled to mothball or "layaway" all the facilities and infrastructure at Fitzsimons except for those being retained for use by the Federal Government (i.e., Army Caretaker

Force and Army Reserve Enclave). USACERL estimated the cost of this layaway program using guidance spelled out in U.S. Army Center for Public Works Technical Note 420-10-08 and USACERL Technical Report (TR) M-91/23, *Layaway Procedures for Facilities, Volume II: Inspection and Maintenance Repair Checklists*. The cost estimating procedures were supplemented with information USACERL gained from conversations with several Fitzsimons facilities engineers and from the experience of USACERL researchers.

USACERL estimated the layaway and annual M&R costs for nearly 1.5 million sq ft of buildings and supporting infrastructure at Fitzsimons based on three levels of layaway. Each of these layaway levels corresponds to a decreasing level of care. For example, Layaway Level One would be used when the intent is to revive the facility later with as little effort as possible (i.e., to support reuse by an LRA); whereas Level Three assumes the building will be more or less abandoned (i.e., an approved reuse plan contemplates demolition or no reuse for the property is obvious). Tables 9.1 and 9.2 provide a range of values for the cost of one-time layaway followed by annual M&R for each of the described layaway levels. An expanded discussion of these one-time layaway costs and annual M&R costs follows the tables.*

Table 9.1. One-time layaway cost estimates for the Fitzsimons EDC parcel.

Layaway Level Three		Layaway Level Two		Layaway Level One	
Total min	Total high	Total min	Total high	Total min	Total high
\$274,004	\$548,008	\$719,261	\$1,258,706	\$538,516	\$1,077,150

Table 9.2. Annual M&R cost estimates for the Fitzsimons EDC parcel.

M&R Level Three		M&R Level Two		M&R Level One	
Total min	Total high	Total min	Total high	Total min	Total high
\$176,155	\$352,311	\$581,313	\$1,017,298	\$1,087,187	\$1,956,936

Layaway Level One. In this layaway level, buildings are laid away, secured, frequently inspected, repaired, and have most utilities active. The intent of this level of layaway is to reactivate the facility at a later date with as little effort as possible. Buildings are heated at 55 °F in the winter and cooled to 80 °F in the summer.

* M&R costs include *minimum* costs to keep buildings heated through the operation of the central heating plant.

Annual M&R in the years following the one-time layaway would include a security force patrolling the area, a small interdisciplinary workforce to inspect the infrastructure systems frequently and make necessary repairs, and a regular landscape and maintenance schedule.

Layaway Level Two. In this level of layaway, buildings are laid away, secured, frequently inspected, repaired, and have most utilities shut off. The intent of this level of layaway is to have the facility available for future use. Utilities will be maintained on an “as needed” basis by the security force, inspectors, and caretaker force.

Annual M&R in the years following the one-time layaway would include a security force patrolling the area, a small interdisciplinary caretaker force that would inspect the infrastructure systems annually and make minor repairs, and a regular landscape maintenance schedule.

Layaway Level Three. This level of layaway is the “do nothing” level as outlined in USACERL TR M-91/23, *Layaway Procedures for U.S. Army Facilities, Volume 1: Decision Criteria and Economics*. Simply put, the installation personnel will “lock the door as they leave the building,” abandon the facility, and do no maintenance on the infrastructure. Buildings will have the personal items removed, be cleaned (swept/mopped), and be secured. Utilities will be abandoned or cut in place.

Layaway Level Three annual M&R is minimal. However, security for the installation will still be required as will some facilities to house the security force and minor landscape maintenance.

Probable Layaway and M&R Program in the Absence of an EDC

If the EDC is not approved in a timely manner, and the Army is forced to continue its caretaker function at Fitzsimons, it is likely that the Army would be required to maintain the property so as to allow for parcelization and redevelopment of the base in accordance with the Reuse Plan for Fitzsimons. Therefore, the probable layaway and M&R program for the EDC parcel would likely include layaway and M&R consistent with the requirements of Layaway Level One to ensure rapid property transfer through willing buyers. Table 9.3 provides a range of costs for this scenario.

Table 9.3. Likely Army layaway and M&R commitments.

EDC Parcel	Layaway Level One	
	Total min	Total high
	\$538,516	\$1,077,150
M&R Level One		
EDC Parcel	Total min	Total high
	\$1,087,187	\$1,956,936
Total	\$1,625,703	\$3,034,086

Based on the projected costs presented in Table 9.3, the Army could expect to incur at least \$1.6 million in first-year carrying costs for Fitzsimons in the absence of an EDC. Since the FRA is prepared to assume responsibility for the EDC parcel as soon as possible, the Army should consider an O&M cost avoidance to the extent that a successful conveyance cannot be achieved in a timely manner.

Anticipated Consideration from the Conveyance

Summary of FRA Proposal

The FRA application proposes \$1 million as consideration to the Army for the 332-acre EDC parcel and supporting water, sewer, drainage, gas, electric, communications, and internal roadway systems. The applicant argues for the following primary EDC terms and conditions:

1. The FRA will pay the Army \$1 million amortized over 5 yr beginning in 2012 at a 6% interest rate.
2. Interest will not begin accruing until 2012.
3. The proposed purchase price was calculated assuming all housing units contain lead-based paint hazards that will require remediation. If the Army will, at its sole expense, perform the testing required to determine that less than all the housing units require remediation, the FRA will adjust the purchase price accordingly.
4. Sections of the EDC parcel will be conveyed as they become environmentally cleared and available for transfer by deed. Sections unavailable for deed transfer will be requested under a lease in furtherance of a conveyance.

5. The Army will continue to operate the central steam plant for up to 24 mo after closure to allow time for reusable buildings to be retrofitted with individual package boilers.
6. If required, the Army will subordinate their interest in the property in order to allow the FRA or other parties to obtain financing.
7. The Army will decommission, environmentally clean, and demolish the current wastewater treatment plant and provide a connection to the metropolitan sanitary sewer system. The Army will also connect the golf course irrigation system to the potable water supply system.

USACERL Findings

USACERL provided extensive discussion in Chapter 4, **Business Plan Review and Market and Financial Feasibility Analysis**, regarding the analysis of the applicant's business plan and the NPV of the business plan. In summary, USACERL concluded that the applicant adequately demonstrated business plan market and financial feasibility. However, USACERL's independent investigation led to the development of a scenario that marginally enhances financial feasibility through a set of independently supportable assumptions. USACERL calculated the recommended range of business plan value to be *positive* \$2.5 to \$4.5 million.

Level of Investment

The FRA has proposed to underwrite a majority of the costs associated with the redevelopment of Fitzsimons including \$28.2 million in operating expenditures and \$31.7 million in infrastructure improvements. These costs are to be offset with real estate revenues, but external financing sources such as EDA grants, TIF bonds, and state and local support may be available. The FRA's anticipated return from investment is the creation of over 3,700 onsite bioscience and related jobs facilitated through a quality bioscience park. USACERL's analysis concluded that the FRA has a reasonable probability of achieving investment levels and job creation goals, but the business plan is marked by periods of negative cash flow, which will require gap financing and/or grant funding.

Recommendation

Based on the eligibility factors and criteria reviewed for this report, it is USACERL's opinion that the applicant is eligible for an EDC. USACERL

recommends that the Army consider up to \$3.0 million in facility layaway and annual M&R costs when negotiating the final terms and conditions of the conveyance. It is also USACERL's recommendation that the Army look favorably upon the FRA's level of investment, which will likely create over 3,700 jobs, when deciding if a discount from fair market value (FMV) is warranted. Finally, the USACERL-estimated range of business plan value is *positive* \$2.5 to \$4.5 million, which contrasts with the FRA's offer of \$1 million, but the Army's final determination of value and possible consideration must rest largely on both the results of a negotiation process between the Army and the FRA and the results of the Army's FMV appraisal process.

10 Review of Application for Completeness

This chapter summarizes USACERL's review of the FRA's EDC Application for completeness as required by 32 CFR Part 91.7(e)(5). The requirement contents are listed below in italics, followed by USACERL's findings.

1. *Copy of the adopted Reuse Plan.* A copy of the plan is included.
2. *Project narrative, including:*
 - a. *General description of the property requested.* A description is provided in the application, but was found to be somewhat fragmented. The Redevelopment Plan provides an in-depth inventory of all facilities; however, no indication is given as to which properties fall within the bounds of the EDC. Conversely, the EDC application provides transfer and land use plans, but apparently did not provide corresponding EDC acreage by land use. Several conveyance and land-use changes were made since the formal adoption of the Redevelopment Plan, thus complicating USACERL's efforts to reconcile EDC acreage and facilities by land use.
 - b. *Description of intended uses.* A description is provided, including acreage estimates.
 - c. *Description of the economic impact of the closure on local communities.* A minimally acceptable description is provided. Although closure impacts were quantified, underlying assumptions were not available for review.
 - d. *Description of the financial condition of the community.* A copy of the Comprehensive Annual Financial Report for the 1996 fiscal year is included in the application. This report discusses the economic condition of the city and the region, and gives annual revenue, expenditure, and financial resource data. An additional narrative alludes to the Redevelopment Plan as an "unique opportunity to revitalize this section of the city and replace the jobs lost with the closure of Fitzsimons."

- e. *Statement of how the EDC is consistent with the overall Reuse Plan.* The application provides a short discussion of consistency with the adopted Redevelopment Plan, focusing mostly on its conformance with the land uses and conveyance mechanisms described in the Redevelopment Plan.
- 3. *Description of how the EDC will contribute to short- and long-term job creation and economic redevelopment.* A detailed 25-yr schedule illustrating building space and job creation in EDC parcels was included.
- 4. *Business and development plan for the EDC parcel, including:*
 - a. *Development plan, timetable, phasing plan, and cash flow analysis*
 - b. *Market and financial feasibility analysis*
 - c. *Cost estimate or justification for infrastructure and other investments needed for development of the EDC parcel*
 - d. *Local investment and proposed financing strategies for the development.*
- 5. *Statement describing why other authorities - such as negotiated or public sale cannot be used to accomplish the economic development and job-creation goals.* A statement is provided.
- 6. *If a transfer is requested for less than fair market value...then a statement should be provided justifying a discount.* The applicant argues that the fair market value of the EDC parcel is \$1 million, and accordingly requests the EDC parcel for that amount.
- 7. *Statement of the LRA's legal authority to acquire and dispose of the property.* A statement of legal authority is provided.

References

Cited

Base Reuse Implementation Manual (DoD 4165.660M, December 1997).

CB Commercial, *1998 Real Estate Forecast: Denver* (CB Commercial, 1998).

Economic Development Conveyance Application, Fitzsimons Army Medical Center, Colorado (Fitzsimons Redevelopment Authority [FRA], 15 January 1998).

Economic and Planning Systems (EPS), Final Report: Market Feasibility Study for a Bioscience Park at Fitzsimons Army Medical Center (EPS, 9 August 1996).

Ernst & Young, Biotech 97: Alignment, The Eleventh Industry Annual Report (Ernst & Young LLP, 1997).

Fitzsimons Army Medical Center, EPS#5210 (EPS, 9 August 1996).

Fitzsimons Redevelopment Plan (BRW, Inc., 8 January 1998).

Grubb & Ellis, *1998 Real Estate Forecast: Denver* (Grubb & Ellis, 1998).

Application for Public Benefit Transfer of Surplus Federal Real Property for Educational Uses (University of Colorado Health Sciences Center [UCHSC], 12 August 1997).

U.S. Army Corps of Engineers (USACE), Omaha District, Fitzsimons Army Medical Center Fair Market Value Appraisal (USACE, Omaha District, May 1998).

Urban Land Institute (ULI), Research Parks and Facilities: Selected References, Infopacket No. 368 (ULI, July 1997).

Uncited

The Colorado Advanced Technology Institute (CATI), *Colorado's Biological Science and Technology Industry* (CATI, January 1998).

Evenson & Associates, *Manufacturing Competitiveness in Colorado: Industry Cluster Identification and Analysis* (Evenson & Assoc., 24 July 1995).

Fitzsimons Infrastructure Master Plan (BRW, Inc., November 1997).

The New Fitzsimons Newsletter (Fitzsimons Redevelopment Authority [FRA], Spring 1998).

Olson, Robert E., "A University Alliance and the Assets of a Closing Army Post," *Economic Development Commentary*, Vol 21 (Winter 1998).

Appendix A: Caveats and Employment Multipliers by Standard Industrial Classification Code

Caveats Used in Conducting the Analysis

It should be noted that USACERL's analysis and methodology is also subject to several limitations that may distort findings or limit their applicability. These limitations are as follows:

- This analysis is based on static modeling techniques which cannot capture dynamic economic effects that may manifest over a longer period of time, such as 5 to 10 years.
- Since this methodology does not capture underemployment effects and equates all jobs, it does not fully reflect the possibility that former employees will be able to find new employment, but only at a lower compensation level.

It should also be noted that USACERL's analysis relied on the larger region of impact (ROI) used by the Final Environmental Impact Statement, which included both the Denver Primary Metropolitan Statistical Area (PMSA) and two surrounding counties (Boulder and El Paso counties), instead of the area used for the study in the EDC application, which included only the Denver PMSA. Although USACERL has determined that this larger area better represents the economic activities occurring in the area, the selection of a larger ROI also spreads the calculated impacts out over a larger area, which may mask local impacts that are unevenly dispersed.

Employment Multipliers by Standard Industrial Classification (SIC) Code

SIC	Industry	Type I Multiplier*	Type II Multiplier**
1	Dairy Farm Products	1.551244	2.1006
2	Poultry and Eggs	1.706491	2.158133
3	Ranch Fed Cattle	1.184069	1.353697
4	Range Fed Cattle	1.132817	1.278858
5	Cattle Feedlots	1.749007	2.468754
6	Sheep, Lambs and Goats	1.053833	1.097451
7	Hogs, Pigs and Swine	1.350181	1.584999
8	Other Meat Animal Products	0	0
9	Miscellaneous Livestock	1.049023	1.130738
10	Cotton	.0	0
11	Food Grains	1.18437	1.321557
12	Feed Grains	1.299309	1.546213
13	Hay and Pasture	1.062357	1.113605
14	Grass Seeds	1.046486	1.07576
15	Tobacco	0	0
16	Fruits	1.036875	1.295902
17	Tree Nuts	0	0
18	Vegetables	1.598928	2.144161
19	Sugar Crops	1.321582	1.514347
20	Miscellaneous Crops	1.15481	1.24121
21	Oil Bearing Crops	1.155331	1.378282
22	Forest Products	1.374916	1.539426
23	Greenhouse and Nursery Products	1.16997	1.490533
24	Forestry Products	2.186773	2.531492
25	Commercial Fishing	0	0
26	Agricultural, Forestry, Fishery Services	1.023272	1.165542
27	Landscape and Horticultural Services	1.00586	1.200456
28	Iron Ores	0	0
29	Copper Ores	1.532553	3.366207
30	Lead and Zinc Ores	1.486929	2.424447
31	Gold Ores	1.709642	3.232414
32	Silver Ores	0	0
33	Ferroalloy Ores, Except Vanadium	1.487844	2.606908
34	Metal Mining Services	1.212651	2.078518
35	Uranium-radium-vanadium Ores	1.081223	1.934365
36	Metal Ores, Not Elsewhere Classified	1.456811	2.475261
37	Coal Mining	1.769076	3.571097
38	Natural Gas & Crude Petroleum	1.324651	1.894304
39	Natural Gas Liquids	3.190225	4.603963
40	Dimension Stone	1.287617	1.808389
41	Sand and Gravel	1.186358	1.714832
42	Clay, Ceramic, Refractory Minerals, N.E.C.	1.601734	2.487308
43	Potash, Soda, and Borate Minerals	1.797702	3.004471
44	Phosphate Rock	0	0
45	Chemical, Fertilizer Mineral Mininig, N.E.C.	1.341337	2.407806
46	Nonmetallic Minerals (Except Fuels) Service	1.552584	2.366449
47	Misc. Nonmetallic Minerals, N.E.C.	1.384961	2.215349

SIC	Industry	Type I Multiplier*	Type II Multiplier**
48	New Residential Structures	1.427048	1.852495
49	New Industrial and Commercial Buildings	1.488489	2.079408
50	New Utility Structures	1.423877	2.00061
51	New Highways and Streets	1.463382	2.039391
52	New Farm Structures	0	0
53	New Mineral Extraction Facilities	1.048261	1.473181
54	New Government Facilities	1.585646	2.362553
55	Maintenance and Repair, Residential	1.424832	1.925014
56	Maintenance and Repair Other Facilities	1.247899	1.746758
57	Maintenance and Repair Oil and Gas Wells	1.05836	1.457391
58	Meat Packing Plants	2.506043	3.100582
59	Sausages and Other Prepared Meats	1.693261	2.294434
60	Poultry Processing	1.330903	1.755595
61	Creamery Butter	0	0
62	Cheese, Natural and Processed	2.457895	3.803019
63	Condensed and Evaporated Milk	0	0
64	Ice Cream and Frozen Desserts	2.085716	2.854047
65	Fluid Milk	1.942078	2.724096
66	Canned Specialties	2.482808	3.408988
67	Canned Fruits and Vegetables	1.80533	2.376683
68	Dehydrated Food Products	1.555269	2.051842
69	Pickles, Sauces, and Salad Dressings	2.003683	2.676954
70	Frozen Fruits, Juices and Vegetables	0	0
71	Frozen Specialties	1.724883	2.640357
72	Flour and Other Grain Mill Products	2.754357	3.969078
73	Cereal Preparations	5.140319	7.414759
74	Rice Milling	0	0
75	Blended and Prepared Flour	2.56642	3.678777
76	Wet Corn Milling	3.954257	5.949564
77	Dog, Cat, and Other Pet Food	2.948653	4.313136
78	Prepared Feeds, N.E.C	2.301735	3.306009
79	Bread, Cake, and Related Products	1.510247	2.116935
80	Cookies and Crackers	1.732654	2.521612
81	Sugar	2.722169	4.330685
82	Confectionery Products	1.938772	2.649816
83	Chocolate and Cocoa Products	2.151549	2.823693
84	Chewing Gum	0	0
85	Salted and Roasted Nuts & Seeds	2.404916	3.109652
86	Cottonseed Oil Mills	0	0
87	Soybean Oil Mills	5.10724	6.997168
88	Vegetable Oil Mills, N.E.C	0	0
89	Animal and Marine Fats and Oils	1.837253	2.62635
90	Shortening and Cooking Oils	2.561095	3.435719
91	Malt Beverages	2.52206	3.8338
92	Malt	2.836536	3.85462
93	Wines, Brandy, and Brandy Spirits	1.915008	2.471991
94	Distilled Liquor, Except Brandy	0	0
95	Bottled and Canned Soft Drinks & Water	2.402484	3.43615
96	Flavoring Extracts and Syrups, N.E.C.	1.174457	1.427621
97	Canned and Cured Sea Foods	0	0
98	Prepared Fresh Or Frozen Fish Or Seafood	0	0

SIC	Industry	Type I Multiplier*	Type II Multiplier**
99	Roasted Coffee	5.680789	8.006862
100	Potato Chips & Similar Snacks	1.866649	2.571363
101	Manufactured Ice	1.211191	1.647585
102	Macaroni and Spaghetti	2.102261	2.867133
103	Food Preparations, N.E.C.	1.793407	2.475089
104	Cigarettes	0	0
105	Cigars	0	0
106	Chewing and Smoking Tobacco	0	0
107	Tobacco Stemming and Redrying	0	0
108	Broadwoven Fabric Mills and Finishing	1.320642	1.690825
109	Narrow Fabric Mills	1.215874	1.578973
110	Womens Hosiery, Except Socks	0	0
111	Hosiery, N.E.C.	0	0
112	Knit Outerwear Mills	1.231739	1.656085
113	Knit Underwear Mills	0	0
114	Knit Fabric Mills	0	0
115	Knitting Mills, N.E.C.	0	0
116	Yarn Mills and Finishing Of Textiles, N.E.C.	1.448909	1.918933
117	Carpets and Rugs	1.491403	1.874717
118	Thread Mills	0	0
119	Coated Fabrics, Not Rubberized	0	0
120	Tire Cord and Fabric	0	0
121	Nonwoven Fabrics	0	0
122	Cordage and Twine	1.415475	1.775576
123	Textile Goods, N.E.C.	0	0
124	Apparel Made From Purchased Materials	1.280789	1.599199
125	Curtains and Draperies	1.178037	1.413387
126	Housefurnishings, N.E.C.	1.284961	1.54162
127	Textile Bags	1.166265	1.403827
128	Canvas Products	1.153785	1.465044
129	Pleating and Stitching	1.02456	1.212279
130	Automotive and Apparel Trimmings	1.386253	1.718242
131	Schiffi Machine Embroideries	0	0
132	Fabricated Textile Products, N.E.C.	1.434293	1.807377
133	Logging Camps and Logging Contractors	1.400473	1.864492
134	Sawmills and Planing Mills, General	1.515899	2.108252
135	Hardwood Dimension and Flooring Mills	1.185686	1.528865
136	Special Product Sawmills, N.E.C.	1.193796	1.578317
137	Millwork	1.279161	1.744677
138	Wood Kitchen Cabinets	1.194658	1.578777
139	Veneer and Plywood	0	0
140	Structural Wood Members, N.E.C.	1.330101	1.825633
141	Wood Containers	1.188646	1.463181
142	Wood Pallets and Skids	1.233807	1.61455
143	Mobile Homes	0	0
144	Prefabricated Wood Buildings	1.41965	1.891728
145	Wood Preserving	2.109617	3.019477
146	Reconstituted Wood Products	1.690403	2.341961
147	Wood Products, N.E.C.	1.190446	1.530537
148	Wood Household Furniture	1.277178	1.597791
149	Upholstered Household Furniture	1.231875	1.560255

SIC	Industry	Type I Multiplier*	Type II Multiplier**
150	Metal Household Furniture	1.271673	1.66629
151	Mattresses and Bedsprings	1.352012	1.777795
152	Wood Tv and Radio Cabinets	0	0
153	Household Furniture, N.E.C	1.211594	1.621249
154	Wood Office Furniture	1.249167	1.643709
155	Metal Office Furniture	1.952584	2.660115
156	Public Building Furniture	1.498838	2.095199
157	Wood Partitions and Fixtures	1.23124	1.627931
158	Metal Partitions and Fixtures	1.373849	1.851404
159	Blinds, Shades, and Drapery Hardware	1.339683	1.806239
160	Furniture and Fixtures, N.E.C	1.530752	2.092518
161	Pulp Mills	0	0
162	Paper Mills, Except Building Paper	0	0
163	Paperboard Mills	3.04865	4.44313
164	Paperboard Containers and Boxes	1.560601	2.319228
165	Paper Coated & Laminated Packaging	1.518	2.235747
166	Paper Coated & Laminated N.E.C.	1.449498	2.047379
167	Bags, Plastic	0	0
168	Bags, Paper	0	0
169	Die-cut Paper and Board	1.350984	1.770486
170	Sanitary Paper Products	0	0
171	Envelopes	1.458697	2.127247
172	Stationery Products	0	0
173	Converted Paper Products, N.E.C	1.518645	2.048765
174	Newspapers	1.270195	1.759224
175	Periodicals	1.691554	2.391313
176	Book Publishing	1.934522	2.703056
177	Book Printing	1.452632	2.023782
178	Miscellaneous Publishing	1.484614	2.230307
179	Commercial Printing	1.32896	1.823941
180	Manifold Business Forms	1.515605	2.176974
181	Greeting Card Publishing	1.800013	2.378355
182	Blankbooks and Looseleaf Binder	1.399514	1.78185
183	Bookbinding & Related	1.097745	1.373503
184	Typesetting	1.19494	1.575289
185	Plate Making	1.222545	1.792667
186	Alkalies & Chlorine	0	0
187	Industrial Gases	1.215574	2.069083
188	Inorganic Pigments	1.788428	2.540918
189	Inorganic Chemicals Nec.	1.617957	2.533132
190	Cyclic Crudes, Interm. & Indus. Organic Chem.	2.949271	4.52773
191	Plastics Materials and Resins	3.173008	4.470996
192	Synthetic Rubber	0	0
193	Cellulosic Man-made Fibers	0	0
194	Organic Fibers, Noncellulosic	0	0
195	Drugs	2.024721	3.184307
196	Soap and Other Detergents	1.945951	2.876842
197	Polishes and Sanitation Goods	1.509331	2.253769
198	Surface Active Agents	0	0
199	Toilet Preparations	2.220573	3.342432
200	Paints and Allied Products	1.947463	2.886721

SIC	Industry	Type I Multiplier*	Type II Multiplier**
201	Gum and Wood Chemicals	1.869834	2.71929
202	Nitrogenous and Phosphatic Fertilizers	3.48025	4.821961
203	Fertilizers, Mixing Only	1.926276	2.547843
204	Agricultural Chemicals, N.E.C	2.458398	4.026078
205	Adhesives and Sealants	1.783562	2.605154
206	Explosives	1.773501	2.54893
207	Printing Ink	1.669775	2.480961
208	Carbon Black	0	0
209	Chemical Preparations, N.E.C	2.210632	3.620583
210	Petroleum Refining	5.02895	7.70153
211	Paving Mixtures and Blocks	2.078829	3.165292
212	Asphalt Felts and Coatings	1.764175	2.602931
213	Lubricating Oils and Greases	2.908087	4.38763
214	Petroleum and Coal Products, N.E.C.	1.724018	2.543611
215	Tires and Inner Tubes	1.589066	2.035044
216	Rubber and Plastics Footwear	1.370566	1.674678
217	Rubber and Plastics Hose and Belting	1.379683	2.230341
218	Gaskets, Packing and Sealing Devices	1.334477	1.867203
219	Fabricated Rubber Products, N.E.C.	1.444879	2.031202
220	Miscellaneous Plastics Products	1.634519	2.267755
221	Leather Tanning and Finishing	1.539655	2.001924
222	Footwear Cut Stock	0	0
223	House Slippers	0	0
224	Shoes, Except Rubber	0	0
225	Leather Gloves and Mittens	0	0
226	Luggage	1.116376	1.612927
227	Womens Handbags and Purses	1.072043	1.553458
228	Personal Leather Goods	1.069888	1.308876
229	Leather Goods, N.E.C	1.024572	1.309542
230	Glass and Glass Products, Exc Containers	1.423764	1.859493
231	Glass Containers	1.523119	2.144432
232	Cement, Hydraulic	2.298953	3.241329
233	Brick and Structural Clay Tile	1.394876	1.970895
234	Ceramic Wall and Floor Tile	1.444402	1.899052
235	Clay Refractories	1.664757	2.288003
236	Structural Clay Products, N.E.C	0	0
237	Vitreous Plumbing Fixtures	0	0
238	Vitreous China Food Utensils	0	0
239	Fine Earthenware Food Utensils	0	0
240	Porcelain Electrical Supplies	1.541261	2.16464
241	Pottery Products, N.E.C	1.148578	1.378523
242	Concrete Block and Brick	1.59128	2.154196
243	Concrete Products, N.E.C	1.360916	1.881485
244	Ready-mixed Concrete	1.541312	2.210558
245	Lime	0	0
246	Gypsum Products	2.260781	3.084389
247	Cut Stone and Stone Products	1.261323	1.677094
248	Abrasive Products	0	0
249	Asbestos Products	0	0
250	Minerals, Ground Or Treated	1.774681	2.569421
251	Mineral Wool	1.531627	2.675004

SIC	Industry	Type I Multiplier*	Type II Multiplier**
252	Nonclay Refractories	1.862589	2.555067
253	Nonmetallic Mineral Products, N.E.C.	1.331182	1.837333
254	Blast Furnaces and Steel Mills	2.276952	3.871186
255	Electrometallurgical Products	0	0
256	Steel Wire and Related Products	1.877782	2.745138
257	Cold Finishing Of Steel Shapes	0	0
258	Steel Pipe and Tubes	1.692027	2.593199
259	Iron and Steel Foundries	1.399121	2.101103
260	Primary Copper	0	0
261	Primary Aluminum	0	0
262	Primary Nonferrous Metals, N.E.C.	1.67687	3.030217
263	Secondary Nonferrous Metals	3.982736	6.062648
264	Copper Rolling and Drawing	0	0
265	Aluminum Rolling and Drawing	0	0
266	Nonferrous Rolling and Drawing, N.E.C.	1.955368	3.297332
267	Nonferrous Wire Drawing and Insulating	1.57671	2.380313
268	Aluminum Foundries	1.300599	1.898936
269	Brass, Bronze, and Copper Foundries	1.012082	1.258183
270	Nonferrous Castings, N.E.C.	0	0
271	Metal Heat Treating	1.593856	2.374053
272	Primary Metal Products, N.E.C	2.163812	3.156223
273	Metal Cans	1.864701	2.944759
274	Metal Barrels, Drums and Pails	1.4413	2.11928
275	Cutlery	1.155377	1.618859
276	Hand and Edge Tools, N.E.C.	1.289578	1.736703
277	Hand Saws and Saw Blades	0	0
278	Hardware, N.E.C.	1.380961	1.909249
279	Metal Sanitary Ware	1.075808	2.06671
280	Plumbing Fixture Fittings and Trim	1.405078	2.172157
281	Heating Equipment, Except Electric	1.497638	2.829137
282	Fabricated Structural Metal	1.493945	2.12251
283	Metal Doors, Sash, and Trim	1.246369	1.657898
284	Fabricated Plate Work (Boiler Shops)	1.22187	1.784836
285	Sheet Metal Work	1.308032	1.804268
286	Architectural Metal Work	1.199392	1.683691
287	Prefabricated Metal Buildings	1.401758	1.933827
288	Miscellaneous Metal Work	2.045123	2.795379
289	Screw Machine Products and Bolts, Etc.	1.328029	1.837017
290	Iron and Steel forgings	1.295354	1.987449
291	Nonferrous forgings	1.515121	1.977944
292	Automotive Stampings	1.582746	2.096181
293	Crowns and Closures	0	0
294	Metal Stampings, N.E.C.	1.445868	2.140765
295	Plating and Polishing	1.122428	1.505098
296	Metal Coating and Allied Services	1.394391	1.885163
297	Small Arms Ammunition	1.066984	1.266323
298	Ammunition, Except For Small Arms, N.E.C.	0	0
299	Small Arms	0	0
300	Other Ordnance and Accessories	0	0
301	Industrial and Fluid Valves	1.640037	2.42598
302	Steel Springs, Except Wire	1.194899	1.747098

SIC	Industry	Type I Multiplier*	Type II Multiplier**
303	Pipe, Valves, and Pipe Fittings	1.257388	1.762391
304	Miscellaneous Fabricated Wire Products	1.198136	1.68826
305	Metal Foil and Leaf	0	0
306	Fabricated Metal Products, N.E.C.	1.558127	2.206896
307	Steam Engines and Turbines	1.502617	2.314607
308	Internal Combustion Engines, N.E.C.	1.726107	2.485563
309	Farm Machinery and Equipment	1.556651	2.246682
310	Lawn and Garden Equipment	1.741591	2.330128
311	Construction Machinery and Equipment	1.699113	2.355899
312	Mining Machinery, Except Oil Field	1.285785	1.907986
313	Oil Field Machinery	1.146201	1.682075
314	Elevators and Moving Stairways	1.181813	1.520692
315	Conveyors and Conveying Equipment	1.348038	2.021925
316	Hoists, Cranes, and Monorails	1.285547	2.028801
317	Industrial Trucks and Tractors	1.542013	2.141676
318	Machine Tools, Metal Cutting Types	1.222231	1.716795
319	Machine Tools, Metal Forming Types	1.313713	2.051147
320	Industrial Patterns	1.054818	1.503239
321	Special Dies and Tools and Accessories	1.173148	1.709915
322	Power Driven Hand Tools	1.455075	2.169798
323	Rolling Mill Machinery	1.398237	2.169054
324	Welding Apparatus	1.453918	2.140872
325	Metalworking Machinery, N.E.C.	1.970009	2.869394
326	Textile Machinery	1.354687	2.019151
327	Woodworking Machinery	0	0
328	Paper Industries Machinery	1.531079	2.007398
329	Printing Trades Machinery	1.389115	2.270712
330	Food Products Machinery	1.285627	1.833059
331	Special Industry Machinery N.E.C.	1.859533	2.754525
332	Pumps and Compressors	1.528851	2.131034
333	Ball and Roller Bearings	1.38812	2.085214
334	Blowers and Fans	1.207971	1.705089
335	Packaging Machinery	1.619857	2.512402
336	Power Transmission Equipment	1.418525	2.109474
337	Industrial Furnaces and Ovens	0	0
338	General Industrial Machinery, N.E.C.	1.419431	2.074657
339	Electronic Computers	1.898384	2.735583
340	Computer Storage Devices	1.954519	3.116395
341	Computer Terminals	1.017178	1.519772
342	Computer Peripheral Equipment,	1.795709	2.81859
343	Calculating and Accounting Machines	0	0
344	Typewriters and Office Machines N.E.C.	1.374115	1.949863
345	Automatic Merchandising Machine	1.285888	1.737194
346	Commercial Laundry Equipment	1.213736	1.827384
347	Refrigeration and Heating Equipment	1.541632	2.260396
348	Measuring and Dispensing Pumps	1.929747	2.888971
349	Service Industry Machines, N.E.C.	1.513739	2.169625
350	Carburetors, Pistons, Rings, Valves	1.301589	1.904565
351	Fluid Power Cylinders & Actuators	1.483435	2.121571
352	Fluid Power Pumps & Motors	1.0694	1.722884
353	Scales and Balances	1.219433	1.740871

SIC	Industry	Type I Multiplier*	Type II Multiplier**
354	Industrial Machines N.E.C.	1.310662	1.852805
355	Transformers	1.325462	1.772221
356	Switchgear and Switchboard Apparatus	1.415397	2.178093
357	Motors and Generators	1.349243	2.122705
358	Carbon and Graphite Products	0	0
359	Relays & Industrial Controls	1.57463	2.25424
360	Electrical Industrial Apparatus, N.E.C.	2.500257	3.387761
361	Household Cooking Equipment	1.588017	2.277798
362	Household Refrigerators and Freezers	0	0
363	Household Laundry Equipment	0	0
364	Electric Housewares and Fans	1.271135	1.85501
365	Household Vacuum Cleaners	0	0
366	Household Appliances, N.E.C.	0	0
367	Electric Lamps	1.146787	1.457464
368	Wiring Devices	1.23453	1.738971
369	Lighting Fixtures and Equipment	1.502495	2.127468
370	Radio and TV Receiving Sets	1.717385	2.417886
371	Phonograph Records and Tape	1.023047	1.516495
372	Telephone and Telegraph Apparatus	1.591493	2.586909
373	Radio and Tv Communication Equipment	1.680787	2.504923
374	Communications Equipment N.E.C.	1.259352	1.851872
375	Electron Tubes	1.501259	2.15888
376	Printed Circuit Boards	1.201949	1.654547
377	Semiconductors and Related Devices	1.818645	2.750702
378	Electronic Components, N.E.C.	1.793924	2.451707
379	Storage Batteries	1.476826	2.0625
380	Primary Batteries, Dry and Wet	1.357665	2.186579
381	Engine Electrical Equipment	1.276943	1.751442
382	Magnetic & Optical Recording Media	2.261409	3.502879
383	Electrical Equipment, N.E.C.	1.82378	2.804024
384	Motor Vehicles	3.290542	4.702386
385	Truck and Bus Bodies	1.535078	2.138188
386	Motor Vehicle Parts and Accessories	1.628505	2.34103
387	Truck Trailers	1.37801	2.15686
388	Motor Homes	1.353946	1.855909
389	Aircraft	1.597936	2.385345
390	Aircraft and Missile Engines and Parts	1.529756	2.447531
391	Aircraft and Missile Equipment,	1.532663	2.329725
392	Ship Building and Repairing	0	0
393	Boat Building and Repairing	1.358056	1.908778
394	Railroad Equipment	1.52223	2.337449
395	Motorcycles, Bicycles, and Parts	1.395399	2.096367
396	Complete Guided Missiles	1.36767	2.573252
397	Travel Trailers and Camper	1.270758	1.716389
398	Tanks and Tank Components	1.489494	2.409829
399	Transportation Equipment, N.E.C	1.645133	2.374042
400	Search & Navigation Equipment	1.767444	2.880844
401	Laboratory Apparatus & Furniture	2.156961	3.053582
402	Automatic Temperature Controls	1.101641	1.541789
403	Mechanical Measuring Devices	1.497525	2.184838
404	Instruments To Measure Electricity	1.580636	2.596159

SIC	Industry	Type I Multiplier*	Type II Multiplier**
405	Analytical Instruments	2.255681	3.428383
406	Optical Instruments & Lenses	1.682935	2.421108
407	Surgical and Medical Instrument	1.763898	2.572031
408	Surgical Appliances and Supplies	1.820755	2.552685
409	Dental Equipment and Supplies	1.958726	2.712064
410	X-Ray Apparatus	2.134701	3.228182
411	Electromedical Apparatus	1.590609	2.385189
412	Ophthalmic Goods	1.413102	1.94033
413	Photographic Equipment and Supplies	2.175053	3.328663
414	Watches, Clocks, and Parts	1.356121	1.734618
415	Jewelry, Precious Metal	1.202802	1.469595
416	Silverware and Plated Ware	0	0
417	Jewelers Materials and Lapidary Work	1.31081	1.582626
418	Musical Instruments	1.176157	1.748508
419	Dolls	1.090243	1.196933
420	Games, Toys, and Childrens Vehicles	1.423065	1.831053
421	Sporting and Athletic Goods, N.E.C.	1.332183	1.732238
422	Pens and Mechanical Pencils	0	0
423	Lead Pencils and Art Goods	0	0
424	Marking Devices	1.182608	1.559261
425	Carbon Paper and Inked Ribbons	1.282131	1.589986
426	Costume Jewelery	1.089934	1.256911
427	Fasteners, Buttons, Needles, Pins	1.050462	1.239221
428	Brooms and Brushes	0	0
429	Signs and Advertising Displays	1.297354	1.639984
430	Burial Caskets and Vaults	0	0
431	Hard Surface Floor Coverings	0	0
432	Manufacturing Industries, N.E.C.	1.383766	1.729373
433	Railroads and Related Services	1.597386	2.64877
434	Local, Interurban Passenger Transit	1.121523	1.440042
435	Motor Freight Transport and Warehousing	1.64488	2.252114
436	Water Transportation	1.984942	2.457975
437	Air Transportation	1.544407	2.272989
438	Pipe Lines, Except Natural Gas	3.522878	5.376075
439	Arrangement Of Passenger Transportation	1.154945	1.506615
440	Transportation Services	1.443278	2.0784
441	Communications, Except Radio and TV	1.547317	2.705375
442	Radio and TV Broadcasting	2.084805	3.171291
443	Electric Services	1.678429	2.712936
444	Gas Production and Distribution	3.178673	4.842803
445	Water Supply and Sewerage Systems	1.707717	2.369087
446	Sanitary Services and Steam Supply	1.592932	2.635411
447	Wholesale Trade	1.403626	2.040297
448	Building Materials & Gardening	1.03347	1.340026
449	General Merchandise Stores	1.054013	1.246771
450	Food Stores	1.070696	1.370545
451	Automotive Dealers & Service Stations	1.183115	1.618072
452	Apparel & Accessory Stores	1.120781	1.31925
453	Furniture & Home Furnishings Stores	1.077795	1.370348
454	Eating & Drinking	1.14178	1.34272
455	Miscellaneous Retail	1.073188	1.232288

SIC	Industry	Type I Multiplier*	Type II Multiplier**
456	Banking	1.34	1.869645
457	Credit Agencies	1.291052	1.62041
458	Security and Commodity Brokers	1.150696	1.895597
459	Insurance Carriers	1.850253	2.666379
460	Insurance Agents and Brokers	1.194912	1.555963
461	Owner-occupied Dwellings	0	0
462	Real Estate	1.830963	2.249591
463	Hotels and Lodging Places	1.308399	1.614828
464	Laundry, Cleaning and Shoe Repair	1.133199	1.338607
465	Portrait and Photographic Studios	1.260352	1.484829
466	Beauty and Barber Shops	1.265811	1.464381
467	Funeral Service and Crematories	1.082757	1.347583
468	Miscellaneous Personal Services	1.533481	1.829342
469	Advertising	1.396142	1.92593
470	Other Business Services	1.373684	1.767761
471	Photofinishing, Commercial Photography	1.436188	1.848772
472	Services To Buildings	1.087895	1.243164
473	Equipment Rental and Leasing	1.586367	2.146833
474	Personnel Supply Services	1.02488	1.217205
475	Computer and Data Processing Services	1.35192	2.077106
476	Detective and Protective Services	1.057261	1.268557
477	Automobile Rental and Leasing	1.465459	1.897468
478	Automobile Parking and Car Wash	1.104582	1.278654
479	Automobile Repair and Services	1.532155	2.010103
480	Electrical Repair Service	1.223363	1.617965
481	Watch, Clock, Jewelry and Furniture Repair	1.221586	1.500574
482	Miscellaneous Repair Shops	1.254019	1.601735
483	Motion Pictures	1.778116	2.29069
484	Theatrical Producers, Bands Etc.	2.028664	2.478099
485	Bowling Alleys and Pool Halls	1.142979	1.301593
486	Commercial Sports Except Racing	1.054754	2.182195
487	Racing and Track Operation	1.35741	1.682815
488	Amusement and Recreation Services, N.E.C.	1.151755	1.330123
489	Membership Sports and Recreation Clubs	1.163746	1.384269
490	Doctors and Dentists	1.376949	2.143225
491	Nursing and Protective Care	1.118455	1.399188
492	Hospitals	1.214422	1.703133
493	Other Medical and Health Services	1.244079	1.598989
494	Legal Services	1.213229	1.955478
495	Elementary and Secondary Schools	1.258433	1.49198
496	Colleges, Universities, Schools	1.172929	1.410378
497	Other Educational Services	1.207292	1.452386
498	Job Trainings & Related Services	1.164516	1.447651
499	Child Day Care Services	1.187855	1.407605
500	Social Services, N.E.C.	1.16096	1.470058
501	Residential Care	1.066769	1.335122
502	Other Nonprofit Organizations	1.379593	1.75374
503	Business Associations	1.118986	1.396931
504	Labor and Civic Organizations	1.050335	1.162372
505	Religious Organizations	1.614692	2.652331
506	Engineering, Architectural Services	1.544101	2.143555

SIC	Industry	Type I Multiplier*	Type II Multiplier**
507	Accounting, Auditing and Bookkeeping	1.151634	1.442128
508	Management and Consulting Services	1.420905	1.966746
509	Research, Development & Testing Services	1.223326	1.672413
510	Local Government Passenger Transit	1.160841	1.619098
511	State and Local Electric Utilities	1.573901	2.310422
512	Other State and Local Govt Enterprises	2.365623	3.335803
513	U.S. Postal Service	1.19981	1.906917
514	Federal Electric Utilities	0	0
515	Other Federal Government Enterprises	1.103786	1.495843
516	Noncomparable Imports	0	0
517	Scrap	0	0
518	Used and Secondhand Goods	0	0
519	Federal Government - Military	1	1.46807
520	Federal Government - Non-Military	0	0
521	Commodity Credit Corporation	0	0
522	State & Local Government - Education	0	0
523	State & Local Government - Non-Education	0	0
524	Rest Of The World Industry	0	0
525	Domestic Services	0	0
526	Dummy	0	0
527	Dummy	0	0
528	Inventory Valuation Adjustment	0	0

Appendix B: Operations and Business Plan Analyses

Table B1. Projected 25-Year Absorption and Revenues.

Land and Building Absorption and Revenues
Fitzsimons EDC Business Plan

Scenario: FRA Business Plan

	Rentable Area	Year 1998	Year 1999	Year 2000	Year 2001	Year 2002	Year 2003	Year 2004	Year 2005	Year 2006	Year 2007	Year 2008	Year 2009
		1	2	3	4	5	6	7	8	9	10	11	12
Land Sales													
EDA Incubator	60,000		1										1
Single Tenant Building	100,000	-	-	-	1	-	-	-	1	-	-	-	-
Multi-Tenant Building	60,000	80,000	-	-	-	1	-	1	-	1	-	1	1
Leased													
Single Tenant Building		-	60,000	-	100,000	-	-	-	100,000	-	-	100,000	-
Multi-Tenant Building		-	-	-	60,000	-	60,000	-	60,000	-	60,000	-	80,000
Annual Total		-	60,000	-	180,000	-	60,000	-	160,000	-	60,000	100,000	80,000
Cumulative SF Leased		-	60,000	60,000	220,000	220,000	280,000	280,000	440,000	440,000	500,000	600,000	680,000
Annual Acreage Absorbed	FAR	30%		4.6	-	12.2	-	4.6	-	12.2	-	4.6	7.7
Cumulative Acreage Absorbed				4.6	4.6	16.8	16.8	21.4	21.4	33.7	33.7	38.3	52.0
Single Tenant Land Revenues	\$ 8.00	\$ 10.00	\$ -	\$ -	\$ -	\$ 874,000	\$ -	\$ -	\$ 984,000	\$ -	\$ -	\$ 1,344,000	\$ -
Multi-Tenant Ground Lease Income	72%	90%	\$ -	\$ -	\$ -	\$ 48,000	\$ -	\$ 51,840	\$ -	\$ 68,040	\$ -	\$ 68,040	\$ -
Cumulative Ground Lease Income						\$ 48,000	\$ 48,000	\$ 100,440	\$ 100,440	\$ 168,480	\$ 168,480	\$ 236,520	\$ 333,288
Reuse and Interim Revenues				1	2	3	4	5	6	7	8	9	10
Reuse													
Bldg 816 - Burger King	2,695	\$ 10.00	\$ -	\$ -	\$ -	\$ -	\$ 26,950	\$ 26,950	\$ 26,950	\$ 26,950	\$ 26,950	\$ 26,950	\$ 26,950
Bldg 642 - Community Club	14,395	\$ 6.00	\$ 38,900	\$ 77,733	\$ 77,733	\$ 82,535	\$ 82,535	\$ 87,537	\$ 87,537	\$ 87,537	\$ 87,537	\$ 92,939	Demolished
Bldg 628 - Optical Fabrication Lab	25,891	\$ 5.00	\$ -	\$ -	\$ -	\$ 121,688	\$ 121,688	\$ 121,688	\$ 129,117	\$ 129,117	\$ 129,117	\$ 137,049	\$ 137,049
Bldg 262	11,900	\$ 8.80	\$ -	\$ -	\$ -	\$ 96,342	\$ 96,342	\$ 102,257	\$ 102,257	\$ 102,257	\$ 108,573	\$ 108,573	\$ 115,190
Bldg 268	27,600	\$ 8.00	\$ -	\$ 99,360	\$ 203,136	\$ 203,136	\$ 203,136	\$ 220,800	\$ 220,800	\$ 220,800	\$ 234,269	\$ 234,269	\$ 246,559
Bldg 299	14,400	\$ 6.00	\$ -	\$ 39,744	\$ 79,488	\$ 79,488	\$ 79,488	\$ 86,400	\$ 86,400	\$ 86,400	\$ 91,670	\$ 91,670	\$ 97,262
Bldg 290 - Admin Portion	25,000	\$ 11.00	\$ -	\$ -	\$ 129,250	\$ 258,500	\$ 258,500	\$ 274,269	\$ 274,269	\$ 274,269	\$ 290,999	\$ 290,999	\$ 308,750
Less Financed Cost of Bldg 628 Upgrade	121,881	-	\$ 45,300	\$ 90,500	\$ 90,500	\$ 90,500	\$ 90,500	\$ 45,300					
Less Financed Cost of Boilers			\$ 39,650	\$ 79,300	\$ 79,300	\$ 79,300	\$ 79,300	\$ 36,650					
Total		\$ 38,000	\$ 131,887	\$ 537,837	\$ 671,889	\$ 704,764	\$ 752,528	\$ 845,380	\$ 935,286	\$ 978,687	\$ 984,089	\$ 999,509	\$ 945,576
Interim													
Bldg 118	10,381	\$ 11	\$ -	\$ -	\$ -	\$ 105,056	\$ 105,056	\$ 105,056	\$ 116,310	\$ 116,310	\$ 116,310	\$ 57,096	Demolished
Bldg 211	24,547	\$ -	- Demolished										
Bldg 247	13,483	\$ -	- Demolished										
Bldg 249	12,610	\$ -	- Demolished										
Bldg 500 2North (s)	7,925	\$ 12	\$ 39,295	\$ 95,100									
Bldg 609	23,219	\$ -	- Demolished										
Bldg 303	23,754	\$ -											
	116,819												
Total		\$ 39,295	\$ 95,100	\$ -	\$ 105,056	\$ 105,056	\$ 105,056	\$ 116,310	\$ 116,310	\$ 57,096	\$ -	\$ -	
Commercial Use Revenues													
Building													
Town Center Development	5,000					\$ 8,000	\$ 6,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Town Center	50,000	\$ 16.00	\$ -	\$ -	\$ -	\$ 7,900	\$ 16,000	\$ 24,300	\$ 32,900	\$ 41,800	\$ 50,900	\$ 60,300	\$ 70,000

133

	Year 2009 12	Year 2010 13	Year 2011 14	Year 2012 15	Year 2013 16	Year 2014 17	Year 2015 18	Year 2016 19	Year 2017 20	Year 2018 21	Year 2019 22	Year 2020 23	Year 2021 24	Year 2022 25	Year 25-Year Total	
1	-	-	1	-	-	1	-	-	1	-	-	1	-	-	-	7
-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	-	11
100,000	-	100,000	-	-	100,000	-	-	100,000	-	-	100,000	-	-	100,000	-	760,000
-	80,000	-	80,000	-	80,000	-	80,000	-	80,000	-	80,000	-	80,000	-	-	800,000
100,000	80,000	-	180,000	-	90,000	100,000	80,000	-	180,000	-	80,000	100,000	80,000	-	-	1,560,000
-	680,000	680,000	860,000	860,000	840,000	1,040,000	1,120,000	1,120,000	1,300,000	1,300,000	1,380,000	1,480,000	1,560,000	1,560,000	-	-
7.7	6.1	-	13.8	-	6.1	7.7	6.1	-	13.8	-	6.1	7.7	6.1	-	-	110
45.9	52.0	52.0	65.8	65.8	71.9	78.6	85.7	85.7	99.5	99.5	105.6	113.3	119.4	119.4	-	-
44,000 \$	- \$	- \$	\$ 1,470,000	\$ -	\$ 1,805,000	\$ -	\$ -	\$ -	\$ 1,755,000	\$ -	\$ -	\$ 1,920,000	\$ -	\$ -	\$ 9,052,000	
- \$	\$ 96,756	- \$	\$ 105,840	\$ -	\$ 105,840	\$ -	\$ 115,580	\$ -	\$ 126,380	\$ -	\$ 126,380	\$ -	\$ 138,240	\$ -	\$ 1,051,488	
36,820 \$	\$ 333,288	\$ 333,288	\$ 439,128	\$ 439,128	\$ 544,988	\$ 644,988	\$ 680,528	\$ 680,528	\$ 786,888	\$ 786,888	\$ 913,248	\$ 913,248	\$ 1,051,488	\$ 1,051,488	\$ 10,567,152	
30,332 \$	\$ 30,332	\$ 30,332	\$ 32,176	\$ 32,176	\$ 32,176	\$ 32,176	\$ 34,123	\$ 34,123	\$ 34,123	\$ 36,172	\$ 36,172	\$ 36,172	\$ 36,172	\$ 36,172	\$ 673,548	
shed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	\$ 797,522	
37,049 \$	\$ 145,483	\$ 145,483	\$ 145,483	\$ 154,318	\$ 154,318	\$ 154,318	\$ 154,318	\$ 163,756	\$ 163,756	\$ 163,756	\$ 173,797	\$ 173,797	\$ 173,797	\$ 184,439	\$ 3,444,505	
15,190 \$	\$ 115,190	\$ 115,190	\$ 122,208	\$ 122,208	\$ 122,208	\$ 122,208	\$ 129,726	\$ 129,726	\$ 129,726	\$ 137,646	\$ 137,646	\$ 137,646	\$ 146,068	\$ 146,068	\$ 2,777,860	
34,269 \$	\$ 248,559	\$ 248,559	\$ 248,559	\$ 263,721	\$ 263,721	\$ 263,721	\$ 279,808	\$ 279,808	\$ 279,808	\$ 296,877	\$ 296,877	\$ 296,877	\$ 314,986	\$ 314,986	\$ 5,990,057	
91,670 \$	\$ 97,262	\$ 97,262	\$ 97,262	\$ 103,195	\$ 103,195	\$ 103,195	\$ 109,490	\$ 109,490	\$ 109,490	\$ 116,169	\$ 116,169	\$ 116,169	\$ 116,169	\$ 123,255	\$ 2,337,281	
90,999 \$	\$ 306,750	\$ 306,750	\$ 306,750	\$ 327,584	\$ 327,584	\$ 327,584	\$ 347,566	\$ 347,566	\$ 347,566	\$ 368,768	\$ 368,768	\$ 368,768	\$ 391,263	\$ 391,263	\$ 7,182,579	
															\$ 452,800	
															\$ 393,500	
99,509 \$	\$ 945,576	\$ 945,576	\$ 954,438	\$ 1,003,202	\$ 1,003,202	\$ 1,012,668	\$ 1,064,470	\$ 1,064,470	\$ 1,074,440	\$ 1,129,429	\$ 1,129,429	\$ 1,129,429	\$ 1,137,850	\$ 1,196,183	\$ 1,215,397	\$ 22,357,078
															\$ 604,883	
															\$ -	
															\$ -	
															\$ -	
															\$ 134,395	
															\$ -	
															\$ -	
															\$ -	
															\$ -	
															\$ 730,279	
5,000 \$	\$ 5,000	\$ 5,000	\$ 5,000	\$ 50,300	\$ 50,300	\$ 50,300	\$ 50,300	\$ 50,300	\$ 50,300	\$ 50,300	\$ 50,300	\$ 50,300	\$ 50,300	\$ 50,300	\$ 1,558,000	
70,000 \$	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,300	\$ 50,300	\$ 50,300	\$ 50,300	\$ 50,300	\$ 50,300	\$ 50,300	\$ 50,300	\$ 50,300	\$ 50,300	\$ 50,300	\$ 50,300	

2

135

Plan

Year 2010 11	Year 2011 12	Year 2012 13	Year 2013 14	Year 2014 15	Year 2015 16	Year 2016 17	Year 2017 18	Year 2018 19	Year 2019 20	Year 2020 21	Year 2021 22	Year 2022 23	23-Year Total	
\$ 21.44	\$ 21.44	\$ 22.72	\$ 22.72	\$ 22.72	\$ 24.09	\$ 24.09	\$ 24.09	\$ 25.53	\$ 25.53	\$ 25.53	\$ 27.07	\$ 27.07		
) \$ 50,000	) \$ 50,000	) \$ 50,000	) \$ 50,000	) \$ 50,000	) \$ 50,000	) \$ 50,000	) \$ 50,000	) \$ 50,000	) \$ 50,000	) \$ 50,000	) \$ 50,000	) \$ 50,000	
) \$ 1,071,914	) \$ 1,071,914	) \$ 1,136,229	) \$ 1,136,229	) \$ 1,204,403	) \$ 1,204,403	) \$ 1,204,403	) \$ 1,276,667	) \$ 1,276,667	) \$ 1,353,267	) \$ 1,353,267	) \$ 24,919,896		
) \$ 235,399	) \$ 235,399	) \$ 257,056	) \$ 257,056	) \$ 280,705	) \$ 280,705	) \$ 306,530	) \$ 306,530	) \$ 334,731	) \$ 334,731	) \$ 5,584,406			
) \$ 49,037	) \$ 49,037	) \$ 53,450	) \$ 53,450	) \$ 58,261	) \$ 58,261	) \$ 63,504	) \$ 63,504	) \$ 69,219	) \$ 69,219	) \$ 1,161,289			
) \$ 53,596	) \$ 53,596	) \$ 56,811	) \$ 56,811	) \$ 60,220	) \$ 60,220	) \$ 63,833	) \$ 63,833	) \$ 67,663	) \$ 67,663	) \$ 1,245,995			
) \$ 338,032	) \$ 338,032	) \$ 367,317	) \$ 367,317	) \$ 399,186	) \$ 399,186	) \$ 433,867	) \$ 433,867	) \$ 471,613	) \$ 471,613	) \$ 7,991,689			
\$ 1,409,946	\$ 1,409,946	\$ 1,503,547	\$ 1,503,547	\$ 1,603,589	\$ 1,603,589	\$ 1,710,534	\$ 1,710,534	\$ 1,824,880	\$ 1,824,880	\$ 32,911,585				
\$ 53,596	\$ 53,596	\$ 56,811	\$ 56,811	\$ 60,220	\$ 60,220	\$ 63,833	\$ 63,833	\$ 67,663	\$ 67,663	\$ 1,245,995				
\$ 70,497	\$ 70,497	\$ 75,177	\$ 75,177	\$ 80,179	\$ 80,179	\$ 85,527	\$ 85,527	\$ 91,244	\$ 91,244	\$ 1,845,579				
\$ 282,479	\$ 282,479	\$ 308,467	\$ 308,467	\$ 336,846	\$ 336,846	\$ 367,836	\$ 367,836	\$ 401,677	\$ 401,677	\$ 6,701,287				
\$ 49,037	\$ 49,037	\$ 53,450	\$ 53,450	\$ 58,261	\$ 58,261	\$ 63,504	\$ 63,504	\$ 69,219	\$ 69,219	\$ 1,161,289				
\$ 455,609	\$ 455,609	\$ 483,906	\$ 483,906	\$ 535,506	\$ 535,506	\$ 580,700	\$ 580,700	\$ 629,803	\$ 629,803	\$ 10,754,149				
\$ 954,337	\$ 954,337	\$ 1,009,641	\$ 1,009,641	\$ 1,058,083	\$ 1,058,083	\$ 1,129,835	\$ 1,129,835	\$ 1,195,077	\$ 1,195,077	\$ 22,157,436				
\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0		
\$ 205,000	\$ 205,000	\$ 205,000	\$ 205,000	\$ 205,000										
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 100,000	
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		
\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 575,000	
\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 675,000	
\$ 724,337	\$ 724,337	\$ 779,641	\$ 779,641	\$ 1,043,083	\$ 1,043,083	\$ 1,043,083	\$ 1,104,835	\$ 1,104,835	\$ 1,104,835	\$ 1,170,077	\$ 1,170,077	\$ 19,432,436		
\$ 87,585,271	\$ 88,309,608	\$ 98,088,248	\$ 99,868,000	\$ 10,648,530	\$ 11,691,613	\$ 12,734,985	\$ 13,777,778	\$ 14,802,612	\$ 15,867,447	\$ 17,092,282	\$ 18,262,359	\$ 19,432,436		

2

Table B3. Multi-Tenant Pro Forma

Bio Science Multi-Tenant Building Pro Forma
Fitzsimons EDC Business Plan

Scenario: FRA Business Plan

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Revenue									
Basic Rent		\$ 21.00	\$ 21.00	\$ 21.00	\$ 22.26	\$ 22.26	\$ 22.26	\$ 23.60	\$ 23.60
Rentable SF		60000	60000	60000	60000	60000	60000	60000	60000
Space Rented		30000	60000	60000	60000	60000	60000	60000	60000
Total Basic Rent		\$ 630,000	\$ 1,260,000	\$ 1,260,000	\$ 1,335,600	\$ 1,335,600	\$ 1,415,736	\$ 1,415,736	\$ 1,415,736
Operating Expenses Recovery (\$/SF)	\$ 3.50	\$ 105,000	\$ 210,000	\$ 210,000	\$ 236,670	\$ 236,670	\$ 258,680	\$ 258,680	\$ 258,680
Tax Recovery	0.4870%	\$ 21,915	\$ 43,830	\$ 43,830	\$ 49,528	\$ 49,528	\$ 53,985	\$ 53,985	\$ 53,985
Management Fee	\$ 0.05	\$ 31,500	\$ 63,000	\$ 63,000	\$ 66,780	\$ 66,780	\$ 70,787	\$ 70,787	\$ 70,787
Total Additional Rent		\$ 158,415	\$ 316,830	\$ 316,830	\$ 352,978	\$ 352,978	\$ 383,453	\$ 383,453	\$ 383,453
Total Gross Revenue		\$ 788,415	\$ 1,576,830	\$ 1,576,830	\$ 1,688,578	\$ 1,688,578	\$ 1,688,578	\$ 1,799,189	\$ 1,799,189
Expenses									
Land Lease		\$ 43,200	\$ 43,200	\$ 43,200	\$ 43,200	\$ 43,200	\$ 43,200	\$ 43,200	\$ 43,200
Property Management		\$ 31,500	\$ 63,000	\$ 63,000	\$ 66,780	\$ 66,780	\$ 70,787	\$ 70,787	\$ 70,787
Credit & Vacancies	6%	\$ 47,305	\$ 94,610	\$ 94,610	\$ 101,315	\$ 101,315	\$ 107,951	\$ 107,951	\$ 107,951
Operating Expenses		\$ 105,000	\$ 210,000	\$ 210,000	\$ 236,670	\$ 236,670	\$ 258,680	\$ 258,680	\$ 258,680
Real Estate Taxes		\$ 21,915	\$ 43,830	\$ 43,830	\$ 49,528	\$ 49,528	\$ 53,985	\$ 53,985	\$ 53,985
Total Expenses		\$ 248,920	\$ 454,640	\$ 454,640	\$ 497,493	\$ 497,493	\$ 534,604	\$ 534,604	\$ 534,604
Net Operating Income		\$ 539,495	\$ 1,122,190	\$ 1,122,190	\$ 1,191,085	\$ 1,191,085	\$ 1,191,085	\$ 1,264,585	\$ 1,264,585
Debt Service									
First Mortgage Loan		\$ 954,435	\$ 954,435	\$ 954,435	\$ 954,435	\$ 954,435	\$ 954,435	\$ 954,435	\$ 954,435
Credit Enhancement Fee		\$ 45,000	\$ 45,000	\$ 45,000	\$ 45,000	\$ 45,000	\$ 45,000	\$ 45,000	\$ 45,000
Total Debt Service		\$ 999,435	$ 999,435	$ 999,435	$ 999,435	$ 999,435	$ 999,435	$ 999,435	$ 999,435
Capital Expenses									
Non-Financed Capital Costs		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Leasing Commissions		\$ -	\$ -	\$ -	\$ -	\$ -	\$ 36,000	\$ 36,000	\$ 36,000
Tenant Improvements		\$ -	\$ -	\$ -	\$ -	\$ -	\$ 60,000	\$ 60,000	\$ 60,000
Replacement Reserve (\$/SF)	\$ 0.50	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000
Total Capital Expenses		\$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	\$ 126,000	\$ 126,000	\$ 126,000
Year 10 Reversion									
Net Cash Flow		\$ (489,940)	\$ 92,755	\$ 92,755	\$ 161,650	\$ 161,650	\$ 65,650	\$ 139,150	\$ 139,150
Cumulative Cash Flow		\$ (489,940)	\$ (397,185)	\$ (304,430)	\$ (142,780)	\$ 18,871	\$ 84,521	\$ 223,570	\$ 30
Discounted Cash Flows @ 15%		\$ (426,035)	\$ 70,136	\$ 60,988	\$ 92,424	\$ 80,369	\$ 28,382	\$ 52,311	\$ 4
NPV		\$ 1,545,389							
Principal Owed Value		\$ 9,000,000	\$ 8,826,205	\$ 8,638,577	\$ 8,429,676	\$ 8,203,926	\$ 7,957,612	\$ 7,688,859	\$ 7,395,624
Total Project Costs w/o Land (\$/SF)		\$ 150							
Total Project Costs w/o Land		\$ 9,000,000							
Mortgage Amount		\$ 9,000,000							
Initial Capital Required		\$ -							
Annual Payment		\$ 954,435							
Monthly Payment		\$ 79,536							
Rentable SF		60,000							
Term (years)		20							
Interest		8.75%							
Residual Value		11%							
Ground Lease Percent of Value		9%							
Land Value per Building SF		\$ 8.00							
Annual Ground Lease		\$ 43,200							
Annual Ground Lease (\$/SF)		\$ 0.72							
IRR		43%							

137

	Year 7	Year 8	Year 9	Year 10	10-Year Total
22.26	\$ 23.60	\$ 23.60	\$ 23.60	\$ 25.01	
60000	60000	60000	60000	60000	
60000	60000	60000	60000	60000	
5,600	\$ 1,415,736	\$ 1,415,736	\$ 1,415,736	\$ 1,500,680	\$ 12,904,688
6,670	\$ 258,680	\$ 258,680	\$ 258,680	\$ 282,479	\$ 2,293,530
3,528	\$ 53,985	\$ 53,985	\$ 53,985	\$ 58,844	\$ 478,959
3,780	\$ 70,787	\$ 70,787	\$ 70,787	\$ 75,034	\$ 645,234
2,978	\$ 383,453	\$ 383,453	\$ 383,453	\$ 416,357	\$ 3,417,723
1,578	\$ 1,799,189	\$ 1,799,189	\$ 1,799,189	\$ 1,917,037	\$ 16,322,411
3,200	\$ 43,200	\$ 43,200	\$ 43,200	\$ 43,200	\$ 432,000
6,780	\$ 70,787	\$ 70,787	\$ 70,787	\$ 75,034	\$ 645,234
1,315	\$ 107,951	\$ 107,951	\$ 107,951	\$ 115,022	\$ 979,345
6,670	\$ 258,680	\$ 258,680	\$ 258,680	\$ 282,479	\$ 2,293,530
3,528	\$ 53,985	\$ 53,985	\$ 53,985	\$ 58,844	\$ 478,959
7,493	\$ 534,604	\$ 534,604	\$ 534,604	\$ 574,579	\$ 4,829,068
1,085	\$ 1,264,585	\$ 1,264,585	\$ 1,264,585	\$ 1,342,458	\$ 11,493,343
.435	\$ 954,435	\$ 954,435	\$ 954,435	\$ 954,435	\$ 9,544,351
.000	\$ 45,000	\$ 45,000	\$ 45,000	\$ 45,000	\$ 450,000
.435	\$ 999,435	\$ 999,435	\$ 999,435	\$ 999,435	\$ 9,994,351
-	\$ -	\$ -	\$ -	\$ -	\$ -
.000	\$ 36,000	\$ 36,000	\$ 36,000	\$ 36,000	\$ 180,000
.000	\$ 60,000	\$ 60,000	\$ 60,000	\$ 60,000	\$ 300,000
.000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 30,000	\$ 300,000
.000	\$ 126,000	\$ 126,000	\$ 126,000	\$ 126,000	\$ 780,000
				\$ 12,204,163	
.650	\$ 139,150	\$ 139,150	\$ 139,150	\$ 6,075,496	\$ 6,577,465
.521	\$ 223,670	\$ 382,820	\$ 501,969	\$ 6,577,465	
.382	\$ 52,311	\$ 45,488	\$ 39,555	\$ 1,501,770	
.859	\$ 7,395,624	\$ 7,075,677	\$ 6,726,584	\$ 6,345,690	

2

Table B4. Golf Course Pro Forma

Golf Course Business Plan
Fitzsimons EDC Business Plan

Scenario: FRA Business Plan

	Year 1999	Year 2000	Year 2001	Year 2002	Year 2003	Year 2004	Year 2005	Year 2006	Year 2007
	1	2	3	4	5	6	7	8	9
Revenues									
Restaurant/Concessions	3% \$ 20,000	\$ 20,500	\$ 21,013	\$ 21,538	\$ 22,076	\$ 22,628	\$ 23,194	\$ 23,774	\$ 24,368
Pro Shop Sales	3% \$ 105,000	\$ 108,150	\$ 111,395	\$ 114,736	\$ 118,178	\$ 121,724	\$ 125,375	\$ 129,137	\$ 133,011
Green Fees	2% \$ 675,000	\$ 688,500	\$ 702,270	\$ 716,315	\$ 730,642	\$ 745,255	\$ 760,160	\$ 775,363	\$ 790,870
Driving Range Fees	3% \$ 35,000	\$ 35,875	\$ 36,772	\$ 37,691	\$ 38,633	\$ 39,599	\$ 40,589	\$ 41,604	\$ 42,644
Reservations	3% \$ 7,000	\$ 7,175	\$ 7,354	\$ 7,538	\$ 7,727	\$ 7,920	\$ 8,118	\$ 8,321	\$ 8,529
Golf Cart Rental	3% \$ 120,000	\$ 123,000	\$ 126,075	\$ 129,227	\$ 132,458	\$ 135,769	\$ 139,163	\$ 142,642	\$ 146,208
Pull Carts & Club Rental	3% \$ 7,000	\$ 7,175	\$ 7,354	\$ 7,538	\$ 7,727	\$ 7,920	\$ 8,118	\$ 8,321	\$ 8,529
Total Gross Revenue	\$ 969,000	\$ 990,375	\$ 1,012,233	\$ 1,034,584	\$ 1,057,441	\$ 1,080,814	\$ 1,104,717	\$ 1,129,161	\$ 1,154,159
Direct Expenses									
Personnel	4% \$ 351,000	\$ 365,040	\$ 379,642	\$ 394,827	\$ 410,620	\$ 427,045	\$ 444,127	\$ 461,892	\$ 480,368
Resale Supplies	3% \$ 80,000	\$ 82,400	\$ 84,872	\$ 87,418	\$ 90,041	\$ 92,742	\$ 95,524	\$ 98,390	\$ 101,342
General Operating Supplies	3% \$ 80,000	\$ 81,800	\$ 83,654	\$ 85,564	\$ 87,531	\$ 89,556	\$ 71,643	\$ 73,792	\$ 76,006
Professional Services (soil tests)	3% \$ 1,200	\$ 1,236	\$ 1,273	\$ 1,311	\$ 1,351	\$ 1,391	\$ 1,433	\$ 1,476	\$ 1,520
Other technical fees	3% \$ 12,000	\$ 12,380	\$ 12,731	\$ 13,113	\$ 13,508	\$ 13,911	\$ 14,329	\$ 14,758	\$ 15,201
Utilities - Natural Gas	3% \$ 5,000	\$ 5,150	\$ 5,305	\$ 5,464	\$ 5,628	\$ 5,796	\$ 5,970	\$ 6,149	\$ 6,334
Utilities - Electric	3% \$ 25,000	\$ 25,750	\$ 26,523	\$ 27,318	\$ 28,138	\$ 28,982	\$ 29,851	\$ 30,747	\$ 31,669
Utilities - Water	3% \$ 60,000	\$ 61,800	\$ 63,654	\$ 65,564	\$ 67,531	\$ 69,556	\$ 71,643	\$ 73,792	\$ 76,006
Other Expenses	3% \$ 3,000	\$ 3,090	\$ 3,183	\$ 3,278	\$ 3,377	\$ 3,478	\$ 3,582	\$ 3,690	\$ 3,800
Rental Equipment	3% \$ 36,000	\$ 37,080	\$ 38,192	\$ 39,338	\$ 40,518	\$ 41,734	\$ 42,986	\$ 44,275	\$ 45,604
Building & Equipment Repair and Maintenance	3% \$ 40,000	\$ 41,200	\$ 42,438	\$ 43,709	\$ 45,020	\$ 46,371	\$ 47,762	\$ 49,195	\$ 50,671
Fuel	3% \$ 7,000	\$ 7,210	\$ 7,428	\$ 7,649	\$ 7,879	\$ 8,115	\$ 8,358	\$ 8,609	\$ 8,867
Trash Disposal	3% \$ 1,000	\$ 1,030	\$ 1,061	\$ 1,093	\$ 1,126	\$ 1,159	\$ 1,194	\$ 1,230	\$ 1,267
Management Expenses	3% \$ 50,000	\$ 51,500	\$ 53,045	\$ 54,638	\$ 56,275	\$ 57,964	\$ 59,703	\$ 61,494	\$ 63,339
Deferred Maintenance	3% \$ 70,000	\$ 70,300	\$ 70,300	\$ 70,300	\$ 70,300	\$ 70,300	\$ 70,300	\$ 70,300	\$ 70,300
Purchase of MWR Equipment	0% \$ 53,750	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Direct Expenses	\$ 854,950	\$ 826,946	\$ 853,296	\$ 880,582	\$ 908,839	\$ 867,801	\$ 898,106	\$ 929,490	\$ 961,994
Interfund Charges									
Vehicle Repair	3% \$ 10,000	\$ 10,300	\$ 10,609	\$ 10,927	\$ 11,255	\$ 11,593	\$ 11,941	\$ 12,299	\$ 12,668
Risk Management	3% \$ 10,000	\$ 10,300	\$ 10,609	\$ 10,927	\$ 11,255	\$ 11,593	\$ 11,941	\$ 12,299	\$ 12,668
Building Maintenance	3% \$ 4,000	\$ 4,120	\$ 4,244	\$ 4,371	\$ 4,502	\$ 4,637	\$ 4,776	\$ 4,919	\$ 5,067
Purchase of New Equipment	3% \$ 20,000	\$ 20,800	\$ 21,218	\$ 21,855	\$ 22,510	\$ 23,185	\$ 23,881	\$ 24,597	\$ 25,335
Purchase of Replacement Equipment	3% \$ 40,000	\$ 41,200	\$ 42,438	\$ 43,709	\$ 45,020	\$ 46,371	\$ 47,762	\$ 49,195	\$ 50,671
Total Interfund Charges	\$ 84,000	\$ 86,520	\$ 89,116	\$ 91,789	\$ 94,543	\$ 97,379	\$ 100,300	\$ 103,309	\$ 106,409
Net Cash Flow	\$ 30,050	\$ 76,909	\$ 69,821	\$ 62,213	\$ 54,059	\$ 115,634	\$ 106,311	\$ 96,362	\$ 85,757
Cumulative Cash Flow	\$ 30,050	\$ 106,959	\$ 176,780	\$ 238,993	\$ 293,052	\$ 408,687	\$ 514,998	\$ 611,359	\$ 697,116
Discounted Cash Flows	15% \$ 26,130	\$ 58,154	\$ 45,909	\$ 35,570	\$ 26,877	\$ 49,992	\$ 39,966	\$ 31,501	\$ 24,377
Net Present Value	\$ 384,478								

FRA Business Plan

	Year 2006 8	Year 2007 9	Year 2008 10	Year 2009 11	Year 2010 12	Year 2011 13	Year 2012 14	Year 2013 15	Year 2014 16	Year 2015 17	Year 2016 18	
194 \$ 23,774 \$ 24,368 \$ 24,977 \$ 25,602 \$ 26,242 \$ 13,449 \$ 13,785 \$ 14,130 \$ 14,483 \$ 14,845 \$ 15,216 \$ 361,819												
375 \$ 129,137 \$ 133,011 \$ 137,001 \$ 141,111 \$ 145,345 \$ 74,852 \$ 77,098 \$ 79,411 \$ 81,793 \$ 84,247 \$ 86,775 \$ 1,974,339												
160 \$ 775,363 \$ 790,870 \$ 806,687 \$ 822,821 \$ 839,278 \$ 428,032 \$ 436,592 \$ 445,324 \$ 454,231 \$ 463,315 \$ 472,581 \$ 11,753,236												
589 \$ 41,804 \$ 42,644 \$ 43,710 \$ 44,803 \$ 45,923 \$ 23,536 \$ 24,124 \$ 24,727 \$ 25,345 \$ 25,979 \$ 26,628 \$ 633,183												
118 \$ 8,321 \$ 8,529 \$ 8,742 \$ 8,961 \$ 9,185 \$ 4,707 \$ 4,825 \$ 4,945 \$ 5,069 \$ 5,196 \$ 5,326 \$ 126,637												
163 \$ 142,842 \$ 146,208 \$ 149,864 \$ 153,610 \$ 157,450 \$ 80,693 \$ 82,711 \$ 84,778 \$ 86,898 \$ 89,070 \$ 91,297 \$ 2,170,914												
118 \$ 8,321 \$ 8,529 \$ 8,742 \$ 8,961 \$ 9,185 \$ 4,707 \$ 4,825 \$ 4,945 \$ 5,069 \$ 5,196 \$ 5,326 \$ 126,637												
717 \$ 1,129,161 \$ 1,154,159 \$ 1,179,724 \$ 1,205,868 \$ 1,232,607 \$ 629,976 \$ 643,960 \$ 658,261 \$ 672,888 \$ 687,848 \$ 703,149 \$ 17,146,765												
127 \$ 451,892 \$ 480,368 \$ 499,582 \$ 519,566 \$ 540,348 \$ 280,981 \$ 292,220 \$ 303,909 \$ 316,066 \$ 328,708 \$ 341,857 \$ 7,137,799												
524 \$ 98,390 \$ 101,342 \$ 104,382 \$ 107,513 \$ 110,739 \$ 57,030 \$ 58,741 \$ 60,504 \$ 62,319 \$ 64,188 \$ 66,114 \$ 1,504,259												
643 \$ 73,792 \$ 76,006 \$ 78,285 \$ 80,635 \$ 83,054 \$ 42,773 \$ 44,056 \$ 45,378 \$ 46,739 \$ 48,141 \$ 49,585 \$ 1,128,194												
433 \$ 1,476 \$ 1,520 \$ 1,566 \$ 1,613 \$ 1,661 \$ 855 \$ 881 \$ 908 \$ 935 \$ 963 \$ 992 \$ 22,564												
329 \$ 14,758 \$ 15,201 \$ 15,657 \$ 16,127 \$ 16,811 \$ 8,555 \$ 8,811 \$ 9,076 \$ 9,348 \$ 9,628 \$ 9,917 \$ 225,639												
970 \$ 6,149 \$ 6,334 \$ 6,524 \$ 6,720 \$ 6,921 \$ 3,564 \$ 3,671 \$ 3,781 \$ 3,895 \$ 4,012 \$ 4,132 \$ 94,016												
851 \$ 30,747 \$ 31,869 \$ 32,619 \$ 33,598 \$ 34,806 \$ 17,822 \$ 18,357 \$ 18,907 \$ 19,475 \$ 20,059 \$ 20,661 \$ 470,081												
643 \$ 73,792 \$ 76,006 \$ 78,285 \$ 80,635 \$ 83,054 \$ 42,773 \$ 44,056 \$ 45,378 \$ 46,739 \$ 48,141 \$ 49,585 \$ 1,128,194												
582 \$ 3,890 \$ 3,800 \$ 3,914 \$ 4,032 \$ 4,153 \$ 2,139 \$ 2,203 \$ 2,269 \$ 2,337 \$ 2,407 \$ 2,479 \$ 56,410												
986 \$ 44,275 \$ 45,604 \$ 46,972 \$ 48,381 \$ 49,832 \$ 25,664 \$ 26,434 \$ 27,227 \$ 28,043 \$ 28,885 \$ 29,751 \$ 676,916												
762 \$ 49,195 \$ 50,671 \$ 52,191 \$ 53,757 \$ 55,369 \$ 28,515 \$ 29,371 \$ 30,252 \$ 31,159 \$ 32,094 \$ 33,057 \$ 752,129												
358 \$ 8,609 \$ 8,867 \$ 9,133 \$ 9,407 \$ 9,690 \$ 4,890 \$ 5,140 \$ 5,294 \$ 5,453 \$ 5,616 \$ 5,785 \$ 131,623												
194 \$ 1,230 \$ 1,267 \$ 1,305 \$ 1,344 \$ 1,384 \$ 713 \$ 734 \$ 756 \$ 779 \$ 802 \$ 826 \$ 18,803												
703 \$ 61,494 \$ 63,339 \$ 65,239 \$ 67,196 \$ 69,212 \$ 35,644 \$ 36,713 \$ 37,815 \$ 38,849 \$ 40,118 \$ 41,321 \$ 840,162												
- \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ - \$ 53,750												
106 \$ 929,490 \$ 961,994 \$ 995,657 \$ 1,030,523 \$ 1,066,634 \$ 552,018 \$ 571,389 \$ 591,453 \$ 612,235 \$ 633,763 \$ 656,063 \$ 14,691,738												
141 \$ 12,299 \$ 12,668 \$ 13,048 \$ 13,439 \$ 13,842 \$ 7,129 \$ 7,343 \$ 7,563 \$ 7,790 \$ 8,024 \$ 8,264 \$ 188,032												
341 \$ 12,299 \$ 12,668 \$ 13,048 \$ 13,439 \$ 13,842 \$ 7,129 \$ 7,343 \$ 7,563 \$ 7,790 \$ 8,024 \$ 8,264 \$ 188,032												
76 \$ 4,919 \$ 5,067 \$ 5,219 \$ 5,376 \$ 5,537 \$ 2,852 \$ 2,937 \$ 3,025 \$ 3,116 \$ 3,209 \$ 3,306 \$ 75,213												
181 \$ 24,597 \$ 25,335 \$ 26,095 \$ 26,878 \$ 27,685 \$ 14,258 \$ 14,685 \$ 15,126 \$ 15,580 \$ 16,047 \$ 16,528 \$ 376,065												
62 \$ 49,195 \$ 50,871 \$ 52,191 \$ 53,757 \$ 55,369 \$ 28,515 \$ 29,371 \$ 30,252 \$ 31,159 \$ 32,094 \$ 33,057 \$ 752,129												
700 \$ 103,309 \$ 106,409 \$ 109,601 \$ 112,880 \$ 116,276 \$ 59,882 \$ 61,678 \$ 63,529 \$ 65,435 \$ 67,398 \$ 69,420 \$ 1,579,472												
111 \$ 96,362 \$ 85,757 \$ 74,466 \$ 62,457 \$ 49,697 \$ 18,076 \$ 10,892 \$ 3,280 \$ - \$ - \$ - \$ 915,983												
988 \$ 611,359 \$ 697,116 \$ 771,582 \$ 834,038 \$ 883,735 \$ 901,811 \$ 912,704 \$ 915,983 \$ 915,983 \$ 915,983 \$ 915,983												
166 \$ 31,501 \$ 24,377 \$ 18,407 \$ 13,425 \$ 9,289 \$ 2,938 \$ 1,539 \$ 403 \$ - \$ - \$ - \$ -												

2

Table B5. Infrastructure Costs and Operating Expenses

Infrastructure Costs and Operating Expenses
Fitzsimons EDC Business Plan

Scenario: FRA Business Plan

	Year 1998 1	Year 1999 2	Year 2000 3	Year 2001 4	Year 2002 5	Year 2003 6	Year 2004 7	Year 2005 8	Year 2006 9	Year 2007 10	Year 2008 11	Year 2009 12
Infrastructure Costs												
Roadway	100% \$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 645,775	\$ 665,148	\$ 685,103	\$ 705,656	\$ 726,82
<i>Deflated (1998 \$)</i>	3%	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 525,074	\$ 525,074	\$ 525,074	\$ 525,074	\$ 525,07
Water	100% \$ 42,414	\$ 43,686	\$ 44,997	\$ 46,347	\$ 47,737	\$ 49,169	\$ 50,644	\$ 109,776	\$ 113,069	\$ 116,461	\$ 119,955	\$ 123,55
<i>Deflated (1998 \$)</i>	3%	\$ 42,414	\$ 42,414	\$ 42,414	\$ 42,414	\$ 42,414	\$ 42,414	\$ 89,258	\$ 89,258	\$ 89,258	\$ 89,258	\$ 89,25
Sewer	100% \$ 22,565	\$ 23,242	\$ 23,939	\$ 24,658	\$ 25,397	\$ 26,159	\$ 26,944	\$ 100,395	\$ 103,407	\$ 106,509	\$ 109,705	\$ 112,99
<i>Deflated (1998 \$)</i>	3%	\$ 22,565	\$ 22,565	\$ 22,565	\$ 22,565	\$ 22,565	\$ 22,565	\$ 81,630	\$ 81,630	\$ 81,630	\$ 81,631	\$ 81,63
Storm Drainage	100% \$ 30,990	\$ 31,920	\$ 32,877	\$ 33,864	\$ 34,879	\$ 35,926	\$ 37,004	\$ 264,200	\$ 272,126	\$ 280,290	\$ 288,698	\$ 297,35
<i>Deflated (1998 \$)</i>	3%	\$ 30,990	\$ 30,990	\$ 30,990	\$ 30,990	\$ 30,990	\$ 30,990	\$ 214,819	\$ 214,819	\$ 214,819	\$ 214,818	\$ 214,81
Demolition	3% \$ -	\$ 767,000	\$ 469,387	\$ -	\$ 748,530	\$ -	\$ 1,461,133	\$ 1,524,368	\$ 3,828,134	\$ 2,868,974	\$ -	\$ -
<i>Deflated (1998 \$)</i>	100%	\$ 744,880	\$ 442,423	\$ -	\$ 685,059	\$ -	\$ 1,223,676	\$ 1,239,451	\$ 3,021,964	\$ 2,198,830	\$ -	\$ -
Sub-Total	\$ 95,969	\$ 865,848	\$ 571,180	\$ 104,869	\$ 856,543	\$ 111,254	\$ 1,575,725	\$ 2,644,514	\$ 4,981,884	\$ 4,057,337	\$ 1,224,014	\$ 1,260,73
Steam	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total	\$ 95,969	\$ 865,848	\$ 571,180	\$ 104,869	\$ 856,543	\$ 111,254	\$ 1,575,725	\$ 2,644,514	\$ 4,981,884	\$ 4,057,337	\$ 1,224,014	\$ 1,260,73
Operating Expenses												
Salaries and Wages	\$ 340,000											
Payroll Taxes	\$ 30,000											
Employee Benefits	\$ 54,000											
Office Rent	\$ 20,000											
Office Supplies	\$ 7,500											
Equipment Rental	\$ 800											
Postage	\$ 1,900											
Telephone	\$ 9,600											
Travel	\$ 9,400											
Dues and Subscriptions	\$ 6,500											
Legal and Accounting	\$ 48,600											
Marketing/Advertising	\$ 43,400											
Insurance	\$ 5,000											
Misc	\$ 5,300											
Total Operating Expenses	\$ 580,000											

1

141

2

Table B6. Fitzsimons EDC Business Plan Summary

25-Year Summary Cash Flow
Fitzsimons EDC Business Plan

Scenario: FRA Business Plan

	Year 1998 1	Year 1999 2	Year 2000 3	Year 2001 4	Year 2002 5	Year 2003 6	Year 2004 7	Year 2005 8	Year 2006 9	Year 2007 10	Year 2008 11	Year 2009 12	Year 2010 13
Development Revenues													
Land Sale in Bioscience Park	\$ -	\$ -	\$ -	\$ 874,000	\$ -	\$ -	\$ -	\$ 984,000	\$ -	\$ -	\$ 1,344,000	\$ -	\$ -
Net Cash Flow from Incubator				\$ 278,587	\$ 782,174	\$ 782,174	\$ 827,545	\$ 827,545	\$ 622,545	\$ 672,009	\$ 672,009	\$ 672,009	\$ 724,337
Ground Lease Revenue from Bioscience Park	\$ -	\$ -	\$ -	\$ 48,600	\$ 48,600	\$ 100,440	\$ 100,440	\$ 100,440	\$ 168,480	\$ 168,480	\$ 236,520	\$ 236,520	\$ 333,288
Net Operational Revenue from Golf Course	\$ -	\$ 30,050	\$ 76,909	\$ 69,821	\$ 62,213	\$ 54,059	\$ 115,634	\$ 106,311	\$ 96,362	\$ 85,757	\$ 74,466	\$ 62,457	\$ -
Interim Reuse Revenue	\$ 39,295	\$ 95,100	\$ -	\$ 105,056	\$ 105,056	\$ 105,056	\$ 116,310	\$ 116,310	\$ 57,096	\$ -	\$ -	\$ -	\$ -
Building Reuse Revenue	\$ 38,900	\$ 131,887	\$ 537,837	\$ 671,889	\$ 704,754	\$ 752,528	\$ 845,380	\$ 935,266	\$ 978,687	\$ 984,089	\$ 899,509	\$ 945,576	\$ 950,576
Commercial Land Lease Revenue	\$ -	\$ -	\$ -	\$ 7,800	\$ 16,000	\$ 24,300	\$ 32,900	\$ 41,800	\$ 50,900	\$ 60,300	\$ 563,970	\$ 80,000	\$ -
Residential Rent/Lease Revenue	\$ -	\$ 159,000	\$ 595,000	\$ 620,000	\$ 648,000	\$ 673,000	\$ 701,000	\$ 730,000	\$ 759,000	\$ 790,000	\$ 821,000	\$ -	\$ -
OEAI Grant Funding	\$ 400,000	\$ 300,000	\$ 200,000	\$ 100,000									
Total Development Revenues	\$ 478,195	\$ 716,037	\$ 1,688,333	\$ 3,278,440	\$ 2,364,796	\$ 2,636,928	\$ 2,739,210	\$ 3,704,732	\$ 2,782,533	\$ 2,828,675	\$ 4,611,474	\$ 2,145,658	\$ 2,145,658
Development Costs													
Roadway	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 645,775	\$ 655,148	\$ 685,103	\$ 705,656	\$ 726,826	\$ 1
Water	\$ 42,414	\$ 43,688	\$ 44,997	\$ 46,347	\$ 47,737	\$ 49,169	\$ 50,644	\$ 109,778	\$ 113,069	\$ 116,461	\$ 119,955	\$ 123,554	\$ -
Sewer	\$ 22,565	\$ 23,242	\$ 23,939	\$ 24,658	\$ 25,397	\$ 26,159	\$ 26,944	\$ 100,395	\$ 103,407	\$ 106,509	\$ 109,705	\$ 112,996	\$ -
Storm Drainage	\$ 30,990	\$ 31,920	\$ 32,877	\$ 33,864	\$ 34,879	\$ 35,926	\$ 37,004	\$ 264,200	\$ 272,126	\$ 280,290	\$ 288,698	\$ 297,359	\$ -
Demolition	\$ -	\$ 767,000	\$ 469,367	\$ -	\$ 748,530	\$ -	\$ 1,461,133	\$ 1,524,368	\$ 3,828,134	\$ 2,868,974	\$ -	\$ -	\$ -
Park Specific Improvements	\$ -	\$ 178,100	\$ -	\$ 503,900	\$ -	\$ 200,500	\$ -	\$ 567,200	\$ -	\$ 225,600	\$ 387,400	\$ 319,200	\$ -
Steam													
Total Development Costs	\$ 95,969	\$ 1,043,948	\$ 571,180	\$ 508,769	\$ 884,543	\$ 311,754	\$ 1,578,725	\$ 3,211,714	\$ 4,981,884	\$ 4,282,937	\$ 1,611,414	\$ 1,579,935	\$ -
Operations & Maintenance Costs													
Administration and Marketing	3%	\$ 580,000	\$ 597,400	\$ 615,322	\$ 633,782	\$ 652,795	\$ 672,379	\$ 692,550	\$ 713,327	\$ 734,727	\$ 756,768	\$ 779,472	\$ 802,856
Land Sale Broker's Fees	\$ -	\$ -	\$ -	\$ -	\$ 26,200	\$ -	\$ -	\$ 29,500	\$ -	\$ -	\$ 40,300	\$ -	\$ -
Land Sale Accounting & Legal Fees	\$ -	\$ -	\$ -	\$ -	\$ 17,500	\$ -	\$ -	\$ 19,700	\$ -	\$ -	\$ 26,900	\$ -	\$ -
Real Property Insurance	\$ 1,400	\$ 5,800	\$ 12,600	\$ 14,200	\$ 14,900	\$ 15,300	\$ 15,800	\$ 16,900	\$ 16,800	\$ 15,900	\$ 14,400	\$ 14,900	\$ -
Environmental Insurance for Non-Housing	\$ -	\$ 10,300	\$ 21,200	\$ 21,900	\$ 22,500	\$ 23,200	\$ 23,900	\$ 24,600	\$ 25,300	\$ 26,100	\$ 26,900	\$ 27,700	\$ -
Unreimbursed Utilities in Reuse Buildings	\$ -	\$ 19,500	\$ 6,900	\$ 1,500	\$ -								
Fire Alarm Monitoring	\$ -	\$ 5,200	\$ 10,600	\$ 10,900	\$ 11,300	\$ 11,600	\$ 11,900	\$ 12,300	\$ 12,700	\$ 13,000	\$ 13,400	\$ 13,800	\$ -
Maintenance/Safety of Unoccupied Buildings	\$ -	\$ 31,900	\$ 62,000	\$ 63,900	\$ 61,200	\$ 63,000	\$ 52,700	\$ 45,700	\$ 22,800	\$ 4,400	\$ 4,500	\$ 4,600	\$ -
Snow Plowing	\$ -	\$ 7,700	\$ 15,900	\$ 16,400	\$ 16,900	\$ 17,400	\$ 17,900	\$ 18,400	\$ 19,000	\$ 19,500	\$ 20,200	\$ 20,800	\$ -
Operating Contingency	\$ -	\$ 51,500	\$ 106,100	\$ 109,300	\$ 112,600	\$ 115,900	\$ 119,400	\$ 123,000	\$ 126,700	\$ 130,500	\$ 134,400	\$ 138,400	\$ -
PreSale Grounds Maintenance	\$ -	\$ 17,200	\$ 35,500	\$ 27,600	\$ 28,500	\$ 25,800	\$ 26,800	\$ 24,300	\$ 25,100	\$ 21,800	\$ 15,600	\$ 10,400	\$ -
Total O&M	\$ 581,400	\$ 746,800	\$ 886,122	\$ 943,182	\$ 920,696	\$ 944,879	\$ 960,750	\$ 1,027,127	\$ 983,127	\$ 988,068	\$ 1,076,072	\$ 1,033,456	\$ 1,033,456
Net Cash Flow	\$ (199,174)	\$ (1,074,411)	\$ 231,031	\$ 1,727,489	\$ 687,559	\$ 1,280,895	\$ 202,735	\$ (534,109)	\$ (3,182,477)	\$ (2,442,331)	\$ 1,923,988	\$ (467,733)	\$ 71,113
Cumulative Cash Flow	\$ (199,174)	\$ (1,273,584)	\$ (1,042,853)	\$ 684,934	\$ 1,272,493	\$ 2,553,090	\$ 2,758,825	\$ 2,221,716	\$ (960,761)	\$ (3,403,092)	\$ (1,479,104)	\$ (1,946,837)	\$ (1,113)
Discounted Cash Flows @ 15% ⁽¹⁾	15%	\$ (173,194)	\$ (812,409)	\$ 151,907	\$ 987,698	\$ 292,120	\$ 853,637	\$ 76,215	\$ (174,601)	\$ (904,659)	\$ (603,707)	\$ 413,548	\$ (87,423)
NPV													
Discounted Cash Flows @ 11% ⁽¹⁾	11%	\$ (179,436)	\$ (872,016)	\$ 168,928	\$ 1,137,961	\$ 348,687	\$ 684,659	\$ 97,649	\$ (231,764)	\$ (1,244,109)	\$ (860,151)	\$ 610,449	\$ (133,897)
NPV													

1
 Dog_Biz_Capitality FITZ PRO FORMA

2

Table B7. CERL1 Infrastructure Costs

Infrastructure Costs

Scenario: GEBI 1

1

145

Year 2009 12	Year 2010 13	Year 2011 14	Year 2012 15	Year 2013 16	Year 2014 17	Year 2015 18	Year 2016 19	Year 2017 20	Year 2018 21	Year 2019 22	Year 2020 23	Year 2021 24	Year 2022 25	25-Year Total
08 \$ 617,802	\$ 92,490	\$ 95,265	\$ 98,123	\$ 101,067	\$ 104,099	\$ 315,237	\$ 324,694	\$ 334,435	\$ 344,468	\$ 354,802				\$ 5,078,912
13 \$ 446,313	\$ 64,871	\$ 64,871	\$ 64,871	\$ 64,871	\$ 64,871	\$ 190,724	\$ 190,724	\$ 190,724	\$ 190,724	\$ 190,724	\$ -	\$ -	\$ -	\$ 3,509,538
52 \$ 132,203	\$ 84,698	\$ 87,239	\$ 89,856	\$ 92,552	\$ 95,328	\$ 22,543	\$ 23,219	\$ 23,916	\$ 24,632	\$ 25,372				\$ 1,540,711
06 \$ 95,506	\$ 59,405	\$ 59,406	\$ 59,406	\$ 59,405	\$ 59,406	\$ 13,639	\$ 13,639	\$ 13,639	\$ 13,638	\$ 13,639	\$ -	\$ -	\$ -	\$ 1,115,047
17 \$ 70,058	\$ 25,945	\$ 26,724	\$ 27,526	\$ 28,351	\$ 29,202	\$ 11,260	\$ 11,598	\$ 11,946	\$ 12,305	\$ 12,673				\$ 635,199
11 \$ 50,611	\$ 18,197	\$ 18,198	\$ 18,198	\$ 18,198	\$ 18,198	\$ 6,813	\$ 6,813	\$ 6,813	\$ 6,813	\$ 6,813	\$ -	\$ -	\$ -	\$ 476,039
37 \$ 220,046	\$ 49,539	\$ 51,025	\$ 52,556	\$ 54,132	\$ 55,757	\$ 81,248	\$ 83,684	\$ 86,195	\$ 88,781	\$ 91,445				\$ 1,908,061
36 \$ 158,966	\$ 34,746	\$ 34,746	\$ 34,746	\$ 34,746	\$ 34,746	\$ 49,156	\$ 49,156	\$ 49,156	\$ 49,156	\$ 49,156	\$ -	\$ -	\$ -	\$ 1,374,866
	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 247,395	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1,670,753
							\$ 145,319							\$ 821,900
														\$ 8,119,266
09 \$ 1,791,504	\$ 429,892	\$ 437,474	\$ 445,282	\$ 453,322	\$ 461,606	\$ 690,619	\$ 1,096,240	\$ 716,823	\$ 730,517	\$ 744,623	\$ -	\$ -	\$ -	\$ 2,492,653
39 \$ 1,791,504	\$ 429,892	\$ 437,474	\$ 445,282	\$ 453,322	\$ 461,606	\$ 690,619	\$ 1,096,240	\$ 716,823	\$ 730,517	\$ 744,623	\$ -	\$ -	\$ -	\$ 2,492,653
														\$ 19,831,661

2

Table B8. CERL1 Summary Cash Flow.

25-Year Summary Cash Flow
Fitzsimons EDC Business Plan

Scenario: CERL1

	Year 1998 1	Year 1999 2	Year 2000 3	Year 2001 4	Year 2002 5	Year 2003 6	Year 2004 7	Year 2005 8	Year 2006 9	Year 2007 10	Year 2008 11	Year 2009 12
Development Revenues												
Land Sale in Biosciences Park	\$ -	\$ -	\$ -	\$ 974,000	\$ -	\$ -	\$ -	\$ 984,000	\$ -	\$ -	\$ 1,344,000	\$ -
Net Cash Flow from Incubator	\$ -	\$ -	\$ 278,587	\$ 782,174	\$ 782,174	\$ 827,545	\$ 827,545	\$ 822,545	\$ 872,009	\$ 872,009	\$ 672,009	\$ 724,337
Ground Lease Revenue from Biosciences Park	\$ -	\$ -	\$ -	\$ 48,600	\$ 48,600	\$ 100,440	\$ 100,440	\$ 168,480	\$ 168,480	\$ 236,520	\$ 236,520	\$ 333,288
Net Operational Revenue from Golf Course	\$ -	\$ -	\$ 30,050	\$ 76,806	\$ 89,821	\$ 82,213	\$ 54,059	\$ 115,834	\$ 106,311	\$ 96,382	\$ 85,757	\$ 74,448
Interim Lease Revenue	\$ 39,295	\$ 95,100	\$ -	\$ 105,058	\$ 105,058	\$ 105,058	\$ 118,310	\$ 118,310	\$ 57,098	\$ -	\$ -	\$ 62,457
Building Lease Revenue	\$ 38,800	\$ 131,887	\$ 537,837	\$ 671,889	\$ 704,754	\$ 752,528	\$ 845,380	\$ 905,298	\$ 978,687	\$ 984,069	\$ 899,509	\$ 945,576
Commercial Land Lease Revenue	\$ -	\$ -	\$ -	\$ 7,900	\$ 16,000	\$ 24,300	\$ 32,900	\$ 41,800	\$ 50,900	\$ 60,300	\$ 543,970	\$ 80,000
Residential Rent/Lease Revenue	\$ -	\$ 159,000	\$ 595,000	\$ 820,000	\$ 648,000	\$ 873,000	\$ 701,000	\$ 730,000	\$ 759,000	\$ 790,000	\$ 821,000	\$ -
OEA Grant Funding	\$ 400,000	\$ 300,000	\$ 200,000	\$ 100,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Development Revenues	\$ 478,195	\$ 716,037	\$ 1,586,333	\$ 3,279,440	\$ 2,364,796	\$ 2,536,928	\$ 2,738,210	\$ 3,794,732	\$ 2,782,533	\$ 2,828,675	\$ 4,611,474	\$ 2,145,654
Development Costs												
Roadway	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 548,909	\$ 565,378	\$ 582,338	\$ 599,808	\$ 617,802
Water	\$ 45,383	\$ 48,744	\$ 48,147	\$ 49,591	\$ 51,079	\$ 52,811	\$ 54,189	\$ 117,460	\$ 124,613	\$ 129,352	\$ 132,203	\$ -
Sewer	\$ 13,990	\$ 14,410	\$ 14,842	\$ 15,268	\$ 15,748	\$ 16,219	\$ 16,705	\$ 62,245	\$ 64,112	\$ 66,036	\$ 68,017	\$ 70,058
Storm Drainage	\$ 22,933	\$ 23,821	\$ 24,329	\$ 25,059	\$ 25,810	\$ 26,585	\$ 27,383	\$ 195,508	\$ 201,373	\$ 207,415	\$ 213,637	\$ 220,046
Demolition	\$ -	\$ 575,250	\$ 352,025	\$ -	\$ 561,397	\$ -	\$ 1,095,850	\$ 1,143,276	\$ 2,871,100	\$ 2,151,731	\$ -	\$ -
Park Specific Improvements	\$ -	\$ 131,794	\$ -	\$ 372,808	\$ -	\$ 148,370	\$ -	\$ 419,726	\$ -	\$ 166,944	\$ 266,678	\$ 236,206
Steam (assumes 50% cost sharing with UCHSC)	\$ -	\$ 240,511	\$ 481,023	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Development Costs	\$ 82,306	\$ 1,032,330	\$ 928,364	\$ 462,825	\$ 604,033	\$ 243,785	\$ 1,194,127	\$ 2,487,126	\$ 3,832,945	\$ 3,298,076	\$ 1,296,489	\$ 1,276,316
Operations & Maintenance Costs												
Administration and Marketing	0.03 \$	\$ 580,000	\$ 587,400	\$ 615,322	\$ 633,782	\$ 652,795	\$ 672,379	\$ 682,550	\$ 713,327	\$ 734,727	\$ 758,768	\$ 779,472
Land Sale Broker's Fees	\$ -	\$ -	\$ -	\$ 26,200	\$ -	\$ -	\$ -	\$ 29,500	\$ -	\$ -	\$ 40,300	\$ -
Land Sale Accounting & Legal Fees	\$ -	\$ -	\$ -	\$ 17,500	\$ -	\$ -	\$ -	\$ 19,700	\$ -	\$ -	\$ 28,900	\$ -
Real Property Insurance	\$ 1,400	\$ 5,800	\$ 12,800	\$ 14,200	\$ 14,900	\$ 15,300	\$ 15,900	\$ 16,300	\$ 16,800	\$ 15,900	\$ 14,400	\$ 14,900
Environmental Insurance for Non-Housing	\$ -	\$ 10,300	\$ 21,200	\$ 21,900	\$ 22,500	\$ 22,200	\$ 23,900	\$ 24,800	\$ 25,300	\$ 26,100	\$ 26,800	\$ 27,700
Unrembursed Utilities in Reuse Buildings	\$ -	\$ 19,500	\$ 6,900	\$ 1,500	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Fire Alarm Monitoring	\$ -	\$ 5,200	\$ 10,800	\$ 10,900	\$ 11,300	\$ 11,800	\$ 11,900	\$ 12,300	\$ 12,700	\$ 13,000	\$ 13,400	\$ 13,800
Maintenance/Safety of Unoccupied Buildings	\$ -	\$ 31,900	\$ 62,000	\$ 63,900	\$ 61,200	\$ 62,000	\$ 62,700	\$ 45,700	\$ 22,800	\$ 4,400	\$ 4,500	\$ 4,800
Snow Plowing	\$ -	\$ 7,700	\$ 15,900	\$ 16,400	\$ 16,800	\$ 17,400	\$ 17,900	\$ 18,400	\$ 19,000	\$ 19,800	\$ 20,200	\$ 20,800
Operating Contingency	\$ -	\$ 61,500	\$ 108,100	\$ 109,300	\$ 112,800	\$ 115,900	\$ 119,400	\$ 123,000	\$ 126,700	\$ 130,500	\$ 134,400	\$ 138,400
Presale Grounds Maintenance	\$ -	\$ 17,200	\$ 25,500	\$ 27,800	\$ 29,500	\$ 29,800	\$ 29,800	\$ 24,300	\$ 25,100	\$ 21,800	\$ 15,800	\$ 10,400
Total O&M	\$ 581,400	\$ 746,500	\$ 884,122	\$ 943,182	\$ 920,598	\$ 944,379	\$ 960,750	\$ 1,027,127	\$ 983,127	\$ 984,048	\$ 1,076,072	\$ 1,033,454
Net Cash Flow	\$ (186,511)	\$ (1,062,793)	\$ (118,156)	\$ 1,873,434	\$ 790,049	\$ 1,348,565	\$ 584,333	\$ 180,479	\$ (2,022,539)	\$ (1,458,468)	\$ 2,238,913	\$ (164,114)
Cumulative Cash Flow	\$ (186,511)	\$ (1,246,303)	\$ (1,366,458)	\$ 504,975	\$ 1,297,044	\$ 2,445,609	\$ 3,229,941	\$ 3,420,421	\$ 1,396,882	\$ (61,587)	\$ 2,177,226	\$ 2,813,212
Discounted Cash Flows @ 15% NPV	\$ (161,314)	\$ (803,624)	\$ (77,688)	\$ 1,071,142	\$ 392,404	\$ 583,022	\$ 219,672	\$ 62,268	\$ (575,216)	\$ (360,511)	\$ 481,239	\$ (30,674)
Discounted Cash Flows @ 11% NPV	\$ (167,127)	\$ (842,584)	\$ (84,394)	\$ 1,234,080	\$ 468,867	\$ 720,998	\$ 281,449	\$ 82,654	\$ (791,051)	\$ (513,680)	\$ 710,370	\$ (46,910)
					\$ 3,327,340							

1

147

Year 2009 12	Year 2010 13	Year 2011 14	Year 2012 15	Year 2013 16	Year 2014 17	Year 2015 18	Year 2016 19	Year 2017 20	Year 2018 21	Year 2019 22	Year 2020 23	Year 2021 24	Year 2022 25	Reversions
\$ - \$ -	\$ 1,470,000 \$ -	\$ - \$ -	\$ 1,605,000 \$ -	\$ - \$ -	\$ 1,755,000 \$ -	\$ - \$ -	\$ 1,920,000 \$ -	\$ - \$ -	\$ 1,920,000 \$ -	\$ - \$ -	\$ 1,920,000 \$ -	\$ - \$ -	\$ 1,920,000 \$ -	
\$ 724,337 \$ 724,337	\$ 724,337 \$ 724,337	\$ 779,641 \$ 779,641	\$ 779,641 \$ 779,641	\$ 1,043,083 \$ 1,043,083	\$ 1,043,083 \$ 1,043,083	\$ 1,104,835 \$ 1,104,835	\$ 1,104,835 \$ 1,104,835	\$ 1,104,835 \$ 1,104,835	\$ 1,104,835 \$ 1,104,835	\$ 1,104,835 \$ 1,104,835	\$ 1,170,077 \$ 1,170,077	\$ 1,170,077 \$ 1,170,077	\$ 1,170,077 \$ 1,170,077	
\$ 333,286 \$ 333,286	\$ 439,126 \$ 439,126	\$ 544,968 \$ 544,968	\$ 544,968 \$ 544,968	\$ 660,526 \$ 660,526	\$ 660,526 \$ 660,526	\$ 786,888 \$ 786,888	\$ 786,888 \$ 786,888	\$ 913,246 \$ 913,246	\$ 913,246 \$ 913,246	\$ 913,246 \$ 913,246	\$ 1,051,480 \$ 1,051,480	\$ 1,051,480 \$ 1,051,480	\$ 1,051,480 \$ 1,051,480	
\$ 62,457 \$ 49,897	\$ 18,076 \$ 10,892	\$ 3,280 \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ 9,558,981.82
\$ 945,578 \$ 945,578	\$ 954,438 \$ 1,003,202	\$ 1,003,202 \$ 1,003,202	\$ 1,012,868 \$ 1,064,470	\$ 1,064,470 \$ 1,064,470	\$ 1,074,440 \$ 1,129,429	\$ 1,129,429 \$ 1,129,429	\$ 1,137,850 \$ 1,196,183	\$ 1,196,183 \$ 1,215,397	\$ 1,215,397 \$ 4,051,325	\$ 4,051,325 \$ 4,051,325	\$ 4,051,325 \$ 4,051,325	\$ 4,051,325 \$ 4,051,325	\$ 4,051,325 \$ 4,051,325	\$ 4,051,325 \$ 4,051,325
\$ 80,000 \$ 90,300	\$ 90,300 \$ 90,300	\$ 90,300 \$ 90,300	\$ 90,300 \$ 90,300	\$ 90,300 \$ 90,300	\$ 90,300 \$ 90,300	\$ 90,300 \$ 90,300	\$ 90,300 \$ 90,300	\$ 90,300 \$ 90,300	\$ 90,300 \$ 90,300	\$ 90,300 \$ 90,300	\$ 90,300 \$ 90,300	\$ 90,300 \$ 90,300	\$ 90,300 \$ 90,300	\$ 90,300 \$ 90,300
\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ 820,809.09
\$ 2,146,658 \$ 2,143,194	\$ 3,696,279 \$ 2,323,164	\$ 2,421,391 \$ 3,402,577	\$ 2,858,381 \$ 2,858,381	\$ 2,858,381 \$ 2,858,381	\$ 4,748,710 \$ 3,111,451	\$ 3,111,451 \$ 3,237,811	\$ 8,166,233 \$ 8,166,233	\$ 3,508,048 \$ 3,527,263	\$ 3,527,263 \$ 14,431,216	\$ 14,431,216 \$ 14,431,216	\$ 14,431,216 \$ 14,431,216	\$ 14,431,216 \$ 14,431,216	\$ 14,431,216 \$ 14,431,216	\$ 14,431,216 \$ 14,431,216
\$ 617,802 \$ 92,490	\$ 95,265 \$ 96,123	\$ 101,067 \$ 104,099	\$ 104,099 \$ 315,237	\$ 315,237 \$ 324,694	\$ 324,694 \$ 334,435	\$ 334,435 \$ 344,468	\$ 344,468 \$ 354,802	\$ 354,802 \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -
\$ 132,203 \$ 84,696	\$ 87,239 \$ 89,856	\$ 92,552 \$ 95,328	\$ 95,328 \$ 22,543	\$ 22,543 \$ 22,319	\$ 22,319 \$ 23,916	\$ 23,916 \$ 24,632	\$ 24,632 \$ 25,372	\$ 25,372 \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -
\$ 70,058 \$ 25,845	\$ 24,724 \$ 27,526	\$ 27,351 \$ 29,202	\$ 29,202 \$ 11,260	\$ 11,260 \$ 11,598	\$ 11,598 \$ 11,948	\$ 11,948 \$ 12,305	\$ 12,305 \$ 12,673	\$ 12,673 \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -
\$ 220,048 \$ 49,529	\$ 51,025 \$ 52,556	\$ 54,132 \$ 55,757	\$ 55,757 \$ 81,248	\$ 81,248 \$ 83,884	\$ 83,884 \$ 86,195	\$ 86,195 \$ 86,781	\$ 86,781 \$ 91,445	\$ 91,445 \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ 1,670,753
\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -
\$ 236,206 \$ -	\$ - \$ -	\$ 563,806 \$ -	\$ 265,806 \$ 342,250	\$ 342,250 \$ 282,014	\$ 282,014 \$ 287,356	\$ 287,356 \$ 287,356	\$ 287,356 \$ 317,480	\$ 317,480 \$ 408,702	\$ 408,702 \$ 336,774	\$ 336,774 \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -
\$ 1,276,318 \$ 252,673	\$ 824,060 \$ 264,961	\$ 541,910 \$ 626,636	\$ 626,636 \$ 712,302	\$ 712,302 \$ 890,591	\$ 890,591 \$ 1,128,744	\$ 1,128,744 \$ 470,186	\$ 470,186 \$ 601,752	\$ 601,752 \$ 408,702	\$ 408,702 \$ 336,774	\$ 336,774 \$ 1,670,753	\$ 1,670,753 \$ 1,670,753	\$ 1,670,753 \$ 1,670,753	\$ 1,670,753 \$ 1,670,753	\$ 1,670,753 \$ 1,670,753
\$ 802,856 \$ 826,941	\$ 951,750 \$ 877,302	\$ 903,821 \$ 903,730	\$ 903,730 \$ 958,852	\$ 958,852 \$ 987,411	\$ 987,411 \$ 1,017,034	\$ 1,017,034 \$ 1,047,545	\$ 1,047,545 \$ 1,078,971	\$ 1,078,971 \$ 1,111,340	\$ 1,111,340 \$ 1,144,880	\$ 1,144,880 \$ 1,179,021	\$ 1,179,021 \$ 1,179,021	\$ 1,179,021 \$ 1,179,021	\$ 1,179,021 \$ 1,179,021	\$ 1,179,021 \$ 1,179,021
\$ - \$ -	\$ 44,100 \$ -	\$ - \$ -	\$ 48,200 \$ -	\$ - \$ -	\$ 52,800 \$ -	\$ - \$ -	\$ 57,500 \$ -	\$ - \$ -	\$ 57,500 \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -	\$ - \$ -
\$ 14,900 \$ 29,400	\$ 15,300 \$ 15,800	\$ 16,300 \$ 16,700	\$ 16,700 \$ 17,200	\$ 17,200 \$ 17,800	\$ 17,800 \$ 18,300	\$ 18,300 \$ 18,800	\$ 18,800 \$ 19,400	\$ 19,400 \$ 20,000	\$ 20,000 \$ 20,600	\$ 20,600 \$ 21,200	\$ 21,200 \$ 21,800	\$ 21,800 \$ 21,800	\$ 21,800 \$ 21,800	\$ 21,800 \$ 21,800
\$ 27,700 \$ 28,500	\$ 29,400 \$ 30,300	\$ 31,200 \$ 32,100	\$ 32,100 \$ 33,100	\$ 33,100 \$ 34,000	\$ 34,000 \$ 35,100	\$ 35,100 \$ 36,100	\$ 36,100 \$ 37,200	\$ 37,200 \$ 38,300	\$ 38,300 \$ 39,500	\$ 39,500 \$ 40,700	\$ 40,700 \$ 40,700	\$ 40,700 \$ 40,700	\$ 40,700 \$ 40,700	\$ 40,700 \$ 40,700
\$ 13,800 \$ 14,300	\$ 14,700 \$ 15,100	\$ 15,100 \$ 15,800	\$ 15,800 \$ 16,000	\$ 16,000 \$ 16,500	\$ 16,500 \$ 17,000	\$ 17,000 \$ 17,500	\$ 17,500 \$ 18,000	\$ 18,000 \$ 18,500	\$ 18,500 \$ 19,000	\$ 19,000 \$ 19,500	\$ 19,500 \$ 20,000	\$ 20,000 \$ 20,600	\$ 20,600 \$ 21,200	\$ 21,200 \$ 21,800
\$ 4,800 \$ 4,800	\$ 4,900 \$ 5,100	\$ 5,100 \$ 5,200	\$ 5,200 \$ 5,400	\$ 5,400 \$ 5,500	\$ 5,500 \$ 5,800	\$ 5,800 \$ 6,000	\$ 6,000 \$ 6,200	\$ 6,200 \$ 6,500	\$ 6,500 \$ 6,800	\$ 6,800 \$ 7,000	\$ 7,000 \$ 7,200	\$ 7,200 \$ 7,500	\$ 7,500 \$ 7,800	\$ 7,800 \$ 8,000
\$ 20,800 \$ 21,400	\$ 22,000 \$ 22,700	\$ 22,700 \$ 23,400	\$ 23,400 \$ 24,100	\$ 24,100 \$ 24,800	\$ 24,800 \$ 25,500	\$ 25,500 \$ 26,300	\$ 26,300 \$ 27,100	\$ 27,100 \$ 27,900	\$ 27,900 \$ 28,700	\$ 28,700 \$ 29,500	\$ 29,500 \$ 30,300	\$ 30,300 \$ 31,500	\$ 31,500 \$ 32,500	\$ 32,500 \$ 33,500
\$ 138,400 \$ 142,800	\$ 144,900 \$ 151,300	\$ 151,300 \$ 155,800	\$ 155,800 \$ 160,500	\$ 160,500 \$ 165,300	\$ 165,300 \$ 170,200	\$ 170,200 \$ 175,400	\$ 175,400 \$ 180,600	\$ 180,600 \$ 186,000	\$ 186,000 \$ 191,600	\$ 191,600 \$ 197,400	\$ 197,400 \$ 203,200	\$ 203,200 \$ 203,200	\$ 203,200 \$ 203,200	\$ 203,200 \$ 203,200
\$ 10,400 \$ 10,800	\$ 11,700 \$ 37,800	\$ 37,800 \$ 33,600	\$ 33,600 \$ 29,400	\$ 29,400 \$ 20,400	\$ 20,400 \$ 21,100	\$ 21,100 \$ 5,800	\$ 5,800 \$ 6,800	\$ 6,800 \$ 58,100	\$ 58,100 \$ 50,100	\$ 50,100 \$ 43,500	\$ 43,500 \$ 44,600	\$ 44,600 \$ 44,600	\$ 44,600 \$ 44,600	\$ 44,600 \$ 44,600
\$ 1,633,454 \$ 1,064,641	\$ 1,196,560 \$ 1,156,902	\$ 1,156,902 \$ 1,165,121	\$ 1,165,121 \$ 1,292,730	\$ 1,292,730 \$ 1,242,052	\$ 1,242,052 \$ 1,260,311	\$ 1,260,311 \$ 1,346,834	\$ 1,346,834 \$ 1,376,845	\$ 1,376,845 \$ 1,412,371	\$ 1,412,371 \$ 1,540,940	\$ 1,540,940 \$ 1,446,280	\$ 1,446,280 \$ 1,524,721	\$ 1,524,721 \$ 1,524,721	\$ 1,524,721 \$ 1,524,721	\$ 1,524,721 \$ 1,524,721
\$ (164,114) \$ -	\$ 825,884 \$ 1,675,670	\$ 1,686,200 \$ 884,359	\$ 884,359 \$ 2,113,211	\$ 2,113,211 \$ 904,028	\$ 904,028 \$ 907,479	\$ 907,479 \$ 2,250,132	\$ 2,250,132 \$ 1,262,621	\$ 1,262,621 \$ 1,023,648	\$ 1,023,648 \$ 3,216,591	\$ 3,216,591 \$ 1,690,994	\$ 1,690,994 \$ 14,763,004	\$ 14,763,004 \$ 14,763,004	\$ 14,763,004 \$ 14,763,004	\$ 14,763,004 \$ 14,763,004
\$ 2,613,212 \$ -	\$ 2,838,096 \$ 4,834,765	\$ 5,412,845 \$ 8,107,322	\$ 8,107,322 \$ 8,220,836	\$ 8,220,836 \$ 8,124,344	\$ 8,124,344 \$ 10,032,043	\$ 10,032,043 \$ 12,282,176	\$ 12,282,176 \$ 13,544,796	\$ 13,544,796 \$ 14,558,485	\$ 14,558,485 \$ 17,785,076	\$ 17,785,076 \$ 19,475,076	\$ 19,475,076 \$ 34,236,074	\$ 34,236,074 \$ 34,236,074	\$ 34,236,074 \$ 34,236,074	\$ 34,236,074 \$ 34,236,074
\$ (30,674) \$ -	\$ 134,229 \$ 236,820	\$ 236,820 \$ 110,384	\$ 110,384 \$ 74,203	\$ 74,203 \$ 194,372	\$ 194,372 \$ 73,050	\$ 73,050 \$ 63,764	\$ 63,764 \$ 137,484	\$ 137,484 \$ 67,084	\$ 67,084 \$ 47,295	\$ 47,295 \$ 58,074	\$ 58,074 \$ 448,465	\$ 448,465 \$ 448,465	\$ 448,465 \$ 448,465	\$ 448,465 \$ 448,465
\$ (46,910) \$ -	\$ 212,677 \$ 388,747	\$ 388,747 \$ 187,728	\$ 187,728 \$ 130,742	\$ 130,742 \$ 358,470	\$ 358,470 \$ 138,155	\$ 138,155 \$ 124,940	\$ 124,940 \$ 279,093	\$ 279,093 \$ 141,968	\$ 141,968 \$ 103,053	\$ 103,053 \$ 291,721	\$ 291,721 \$ 138,163	\$ 138,163 \$ 1,066,676	\$ 1,066,676 \$ 1,066,676	\$ 1,066,676 \$ 1,066,676

2

Table B9. Scenario and Sensitivity Analysis.

Fitzsimons Army Medical Center

Scenario and Sensitivity Analysis Table - Range of Scenario NPVs

	Scenario - FRA EDC Application Business Plan	Years 1-8	Revenues Years 1-16	25-Year Total	Development Costs Years 1-8	Years 1-16	25-Year Total
1							
2	<u>Scenario - FRA EDC Application Business Plan</u>	Years 1-8	Revenues Years 1-16	25-Year Total	Development Costs Years 1-8	Years 1-16	25-Year Total
3	<u>Total Project Analysis View</u>						
4	25-Year analysis	\$ 17,507,672	\$ 40,460,043	\$ 83,889,790	8,275,602	23,094,412	31,379,002
5							
6	Analysis with central heating plant operating costs	\$ 17,507,672	\$ 40,460,043	\$ 83,889,790	8,997,136	23,815,946	32,100,536
7							
8							
9							
10	<u>USACERL Developed Scenarios - CERL1</u>	Years 1-8	Revenues Years 1-16	25-Year Total	Development Costs Years 1-8	Years 1-16	25-Year Total
11							
12	1. Impact of reduced Bioscience Park absorption						
13	<u>Total Project Analysis View</u>						
14	25-year analysis	15,406,672	37,970,243	80,520,771	8,997,136	23,815,946	32,100,536
15							
16	Analysis with USACERL-developed reversion calculation	15,406,672	37,970,243	84,572,096	8,997,136	23,815,946	32,100,536
17							
18	<i>Impact of Scenario Assumption from FRA baseline</i>			682,306			
19							
20	2. Impact of decreased infrastructure costs						
21	<u>Total Project Analysis View</u>						
22	25-year analysis	\$ 17,507,672	\$ 40,460,043	\$ 83,889,790	7,076,897	18,658,427	25,505,867
23							
24	Analysis with USACERL-developed reversion calculation	\$ 17,507,672	\$ 40,460,043	\$ 87,941,114	7,076,897	18,658,427	25,505,867
25							
26	<i>Impact of Scenario Assumption from FRA baseline</i>			4,051,325			(6,594,669)
27							
28							
29							
30							
31							
32							
33							
34							
35							

1

149

										Net Present Value (NPV)		
										25 years		
										Discount Rate		
										15%	11%	
Ent Costs 16	25-Year Total	Operations & Maintenance Costs			Total Cash Flows							1
		Years 1-8	Years 1-16	25-Year Total	Years 1-8	Years 1-16	25-Year Total					2
412	31,379,002	7,010,355	15,694,291	28,196,173	2,221,716	1,671,340	24,314,614	\$ 1,222,564	\$ 2,528,059			4
346	32,100,536	7,010,355	15,694,291	28,196,173	1500181.8	949806.1413	23,593,080	\$ 724,423	\$ 1,981,135			5
												6
												7
												8
												9
Ent Costs 16	25-Year Total	Operations & Maintenance Costs			Total Cash Flows							10
		Years 1-8	Years 1-16	25-Year Total	Years 1-8	Years 1-16	25-Year Total					11
346	32,100,536	7,010,355	15,694,291	28,196,173	(600,818)	(1,539,994)	20,224,062	\$ (313,575)	\$ 655,367			14
346	32,100,536	7,010,355	15,694,291	28,196,173	(600,818)	(1,539,994)	24,275,387	\$ (190,506)	\$ 953,577			15
							682,306	(914,928)	(1,027,558)			16
												17
												18
												19
												20
												21
27	25,505,867	7,010,355	15,694,291	28,196,173	3,420,421	6,107,325	30,187,749	\$ 2,455,498	\$ 4,313,749			22
27	25,505,867	7,010,355	15,694,291	28,196,173	3,420,421	6,107,325	34,239,074	\$ 2,578,567	\$ 4,611,960			23
							10,645,994	1,854,145	2,630,824			24
												25
												26
												27
												28
												29
												30
Conclusion: Estimated FRA Business Plan Valuation										15%	11%	31
Reduced Capital Improvements and Inclusion of Year-25 Reversion										\$ 2,578,567	\$ 4,611,960	32
Total of USACERL's Estimation of Net Present Value										\$ 2,578,567	\$ 4,611,960	33
												34
												35

2

Appendix C: Fit-Up Assumptions and Technical Support for Infrastructure Improvement Cost Estimates

Medical Laboratory Assumptions

153 SF/Pn typical for planning. *Timesaver Standards for Building Types*, 3rd Edition, p 503. Deriving estimate from medical lab standards hospitals. Hospital labs standard based on: Lab "module" total 2,000 SF/13 Persons, including director, 2 admin, and 10 technicians; 5 bench areas for tests $10' \times 20' = 1,000$ SF, examination area $10' \times 10' = 100$ SF, blood test and patient toilet 60 SF, director's office 100 SF, technicians' lockers/toilet 150 SF, sterilization 150 SF, administrative and waiting area 300 SF, and storage 100 SF.

65% of facility Gross Square Foot—Timesaver Standards does not cite a use factor for separate medical laboratories, but identifies guidance for hospital medical labs. Use factors for R&D laboratories from 50% to 70% as above are used.

262 Reconfiguration assumptions/notes—Building 262 was constructed as an administrative facility, new in 1994, constructed to be ADA compliant, with restroom facilities exceeding those required for future medical lab occupancy (office occupancy ~80pn vs. ~70 projected for medical laboratory). This estimate is based on demolition of all interior partition walls with the exception of those for the toilets, janitorial and communication rooms, and fires wall separation. New construction will include partitions as appropriate, installation of lab mechanicals/plumbing, new carpet, resilient tile, ceiling tile replacement, and general painting, touch-up. New construction assumes open lab space, enclosed offices (5), enclosed examination areas (5), open blood area (1), patient toilet (2), common sterilization area (1), lockers/break area (2, m/w), common waiting/administrative area (1), and common storage area (1).

Demolition	
Interior partitions	538 LF
Carpet	9,528 SF
New Work	
Interior partitions	4,299 SF

Carpet	3,432	SF
Resilient Tile	7,311	SF
Lab areas	5,581	SF
Cabinets	670	LF
Ceiling tile repnt @ wall junc.	1,076	SF
Interior surf ext. wall	2,556	SF

628 Reconfiguration assumptions/notes—Building 628 was constructed as an optical fabrication laboratory facility, new in 1971. It was modified to be ADA compliant. Current use and planned reuse being the same, fit-up estimate will be limited to “marketability” refurbishing only. Marketability includes painting and refurbishing of all walls, replacement of limited percentage (1%) of ceiling tiles, and limited replacement of lab cabinetry/ mechanicals (25% - plumbing, electric, lighting, & HVAC. 10% cabinetry). No demolition/ new construction is included.

EDC Proforma assumes 25,891 developable; Net developable includes all area for reuse except that taken up by structure, walls, or mechanical/janitorial spaces. All other space, including restrooms and locker areas are included as developable;

Demolition

Resilient Tile	15,894	SF
Carpet	2,846	SF

New Work

Carpet	2,846	SF
Resilient Tile	15,894	SF
Lab areas	10,728	SF
Cabinets	1,287	LF
Ceiling Tile Replacement	20,723	SF
Paint interior doors/windows	1,272	SF
Paint interior partition walls	33,308	SF
Paint interior surface ext. wall	7,700	SF

Table C.1. Cost comparisons for road improvements as proposed by FRA.

Project	FRA	FRA Project Cost Estimate			Evaluation of FRA Proposal			CERL Alternative Scenario (CERL 1)		
		20% cont	20% soft	Total Cost	Cost	Total Project Estimate	Chargeable Estimate	Total Project Estimate	Low	High
Colfax Ave	\$1,898,400	\$379,580	\$455,616	\$2,733,696	\$0	\$2,058,000	\$2,468,000	\$574,000	\$679,000	\$0
Pearl-1	\$468,000	\$93,600	\$112,320	\$673,920	\$0	\$0	\$15,000	\$15,000	\$18,000	\$0
Pearl-2 included					\$0	\$116,000	\$137,000	\$116,000	\$137,000	\$0
Subt Ph 1	\$2,366,400			\$3,407,616	0	\$2,219,000	\$2,623,000	\$705,000	\$834,000	\$0
Link-2	\$198,165	\$39,533	\$47,560	\$285,358	17%	\$48,511	\$234,000	\$39,780	\$47,090	\$39,780
Link-3	\$450,315	\$90,075	\$108,090	\$648,340	17%	\$110,252	\$78,000	\$133,790	\$158,100	\$158,100
Link-4	\$414,345	\$82,869	\$99,446	\$596,857	17%	\$101,432	\$542,000	\$92,140	\$108,970	\$108,970
Link-6	\$403,536	\$80,707	\$96,849	\$581,092	17%	\$98,786	\$350,000	\$59,500	\$641,000	\$59,500
Link-8	\$329,130	\$65,826	\$78,991	\$473,947	100%	\$473,947	\$252,000	\$298,000	\$252,000	\$298,000
Link-9	\$128,790	\$25,758	\$30,910	\$185,458	100%	\$185,458	\$131,000	\$155,000	\$131,000	\$155,000
Link-11	\$160,272	\$32,054	\$38,465	\$230,792	0	\$0	\$182,000	\$215,000	\$182,000	\$215,000
Link-12	\$75,128	\$15,026	\$18,031	\$108,184	50%	\$54,092	\$107,000	\$127,000	\$127,000	\$127,000
Link-13	\$100,170	\$20,034	\$24,041	\$144,245	50%	\$72,122	\$144,000	\$171,000	\$72,000	\$85,500
Link-14	\$343,440	\$68,688	\$82,426	\$494,554	50%	\$247,277	\$307,000	\$363,000	\$153,500	\$181,500
Link-15	\$457,920	\$91,584	\$109,901	\$659,405	50%	\$329,702	\$367,000	\$433,000	\$216,500	\$263,000
Link-16	\$157,410	\$31,482	\$37,778	\$226,670	50%	\$113,335	\$111,000	\$132,000	\$55,500	\$66,000
Link-17	\$171,720	\$34,344	\$41,213	\$247,277	50%	\$123,638	\$121,000	\$121,000	\$51,500	\$60,500
Link-18	\$515,160	\$103,032	\$123,638	\$741,830	100%	\$634,000	\$750,000	\$634,000	\$750,000	\$750,000
Subt Ph 2	\$3,905,561			\$5,624,008		\$2,700,382	\$4,251,000	\$5,027,000	\$1,911,710	\$2,261,040
Link-1	\$1,080,900	\$216,180	\$259,416	\$1,556,496	17%	\$264,604	\$1,457,000	\$1,721,000	\$247,690	\$292,570
Link-5	\$522,435	\$104,487	\$125,384	\$752,306	17%	\$127,882	\$680,000	\$803,000	\$115,600	\$136,510
Link-20	\$171,720	\$34,344	\$41,213	\$247,277	0	\$0	\$195,000	\$231,000	\$0	\$0
Subt Ph 3	\$1,775,055			\$2,556,079		\$392,496	\$2,332,000	\$2,755,000	\$363,290	\$429,080
Link-7	\$243,270	\$48,654	\$58,385	\$350,309	100%	\$350,309	\$212,000	\$251,000	\$212,000	\$251,000
Link-10	\$558,090	\$111,618	\$133,942	\$803,650	100%	\$803,650	\$763,000	\$901,000	\$763,000	\$901,000
Subt Ph 4	\$801,360			\$1,153,953		\$1,153,953	\$975,000	\$1,152,000	\$975,000	\$1,152,000
Totals	\$8,848,376			\$12,741,661		\$4,246,837	\$9,777,000	\$11,557,000	\$3,250,000	\$3,842,120
Res Park				\$2,175,000	100%	\$2,175,000	\$2,175,000	\$2,175,000	\$1,804,000	\$1,804,000
EDC Total				\$14,916,661		\$6,421,837			\$5,295,500	\$5,294,120

Table C.2. Widen Colfax Avenue one lane in each direction.

Action	Quantity	UOM	Cost/Unit	Total Cost	Means Ref. No.	Book
Add two lanes to existing 4 lanes						
<i>Repair existing with an overlay</i>						
Sweep and remove debris	260	MSF	\$2.22	\$577	029-710-6420	98 Site p. 125
Repair potholes & damages (EST 15% of existing)	4,332	SY	\$13.05	\$56,533	029-710-5910	98 Site p. 125
Install 1-1/2" binder course	28,880	SY	\$2.82	\$81,442	025-104-0160	98 Site p. 67
Install 1-1/2" overlay	28,880	SY	\$3.30	\$95,304	025-104-0460	98 Site p. 68
Compaction of 3" asphalt surface	2,407	CY	\$0.20	\$481	022-226-5020	98 Site p. 44
Layout of pavement marking	0	LF	\$0.04	\$0	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic)	0	LF	\$0.80	\$0	025-804-0710	98 Site p. 75
<i>Remove existing sidewalk and curb and gutter</i>						
Remove curb and gutter	10,830	LF	\$3.91	\$42,345	020-554-2500	98 Site p. 28
Remove sidewalk	4,813	SY	\$7.15	\$34,415	020-254-4200	98 Site p. 28
Rubbish handling	1,517	CY	\$14.40	\$21,845	020-620-3080	98 Site p. 29
Haul debris to dump	1,517	CY	\$12.80	\$19,418	020-620-5000	98 Site p. 29
Disposal fee for debris	1,517	CY	\$6.00	\$9,102		
<i>Add 2 new lanes</i>						
Remove 20" soil	14,039	CY	\$1.64	\$23,024	022-242-2000	96 Site&Work
Grade remaining soil	25,270	SY	\$0.58	\$14,657	025-122-0100	96 Site&Work
Install and compact 12" crushed stone base material	25,270	SY	\$19.20	\$485,184	022-308-0400	98 Fac p. 68
Install 4" binder course	25,270	SY	\$7.00	\$176,890	025-104-0200	98 Fac p. 78
Install 4" wearing course	25,270	SY	\$7.30	\$184,471	025-104-0460	98 Fac p. 78
Compaction of 8" asphalt surface	5,616	CY	\$0.47	\$2,639	022-226-5020	98 Fac p. 68
<i>Paint markings</i>						
Layout of crosswalk	14	LF	\$0.04	\$1	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	1,092	LF	\$1.17	\$1,278	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	27,075	LF	\$0.04	\$1,083	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	27,075	LF	\$0.80	\$21,660	025-804-0710	98 Site p. 75
<i>Install new curb & gutter plus catch basin</i>						
Excavate for curb and gutter	786	CY	\$4.97	\$3,908	022-254-0500	97 Site
Install curb and gutter	10,830	LF	\$8.90	\$96,387	025-025-0448	97 Site
Install catch basins	108	EA	\$1,535.00	\$165,780	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	11,913	LF	\$5.30	\$63,139	027-108-3020	97 Site p. 87
<i>Install sidewalks</i>						
Remove existing soil	4,813	SY	\$6.70	\$32,249	020-554-1750	97 Site p. 28
Grade soil	4,813	SY	\$0.72	\$3,466	0225-122-1020	97 Site p. 63
Install sidewalk	5,415	LF	\$13.20	\$71,478	A12.7-140-1580	97 Assemblies p. 421
<i>Install trees and sod next to sidewalk and median</i>						
Hauling of fill	2,741	CY	\$23.00	\$63,041	022-266-0560	97 Site p. 46
Spread fill material	2,741	CY	\$1.40	\$3,837	022-262-0010	97 Site p. 46
Install sod	222	MSF	\$505.00	\$112,110	029-316-0300	97 Site p. 116
Install trees and pit	181	EA	\$100.07	\$18,113	A12.7-421-0000/R	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
<i>Install traffic control directional signs</i>						
Install new signs	14	EA	\$77.50	\$1,085	028-412-0600 & 02	97 Site
Excavate for new posts	5	CY	\$4.48	\$22	022-254-0060	97 Site
Concrete for new posts	5	CY	\$520.00	\$2,540	033-130-1520	97 Site
<i>Install reflective street signs</i>						
Install new signs	14	EA	\$97.00	\$1,358	104-304-4900	97 Site
Excavate for new posts	5	CY	\$4.48	\$22	022-254-0060	97 Site
Concrete for new posts	5	CY	\$520.00	\$2,540	033-130-1520	97 Site
<i>Install street lights</i>						
Install street lights 400 watt	54	EA	\$2,085.00	\$112,590	A12.7-500-2330	
SUBTOTAL				\$2,026,012		
City cost index						
TOTAL				\$1,898,373		
TOTAL with contingency of:				\$2,088,211		
TOTAL with contingency of:				\$2,467,885		
ROUNDED TO				\$2,088,000		
ROUNDED TO				\$2,468,000		

Table C.3. Peoria-1 - Open Harlow Avenue entrance In 1998 (FRA).

Action	Quantity	UOM	Cost/Unit	Total Cost	Means Ref. No.	Book
Repair existing with an overlay						
Sweep and remove debris	9	MSF	\$2.13	\$19	029-710-6420	96 Site&Work
Cut soil from West Guard House)	7	CY	\$1.64	\$12	022-242-2000	96 Site&Work
Grade soil	13	SY	\$0.72	\$9	025-122-1020	98 Site p. 69
Install and compact crushed 12" stone base material	13	SY	\$19.15	\$243	022-308-0300	98 Site p. 53
Install 4" binder course	13	SY	\$6.95	\$88	025-104-0200	98 Site p. 67
Install 4" wearing course	13	SY	\$8.43	\$107	025-104-0340 +	98 Site p. 68
Compaction of asphalt surface	3	CY	\$1.41	\$4	025-226-5020	
Repair potholes & damages (EST 15% of existing)	150	SY	\$8.45	\$1,268	029-710-5910	96 Site&Work
Install 1-1/2" binder course	1,000	SY	\$2.82	\$2,820	025-104-0160	97 Site&Work
Install 1-1/2" overlay	1,000	SY	\$3.27	\$3,270	025-104-0460	97 Site&Work
Compaction of 3" asphalt surface	56	CY	\$1.41	\$78	022-226-5020	96 Site&Work
Layout of pavement marking	750	LF	\$0.04	\$30	025-804-0790	96 Site&Work
Install pavement marking (Thermoplastic)	750	LF	\$0.47	\$353	025-804-0710	96 Site&Work
Install reflective street signs						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
Install street lights						
Install street lights 400 watt	1	EA	\$2,085.00	\$2,085	A12.7-500-2330	
Removals						
West Gate Guard House (Bldg 25)	114	SF	\$9.35	\$1,066	CERL estimate	
Roller Gate Assy	1	EA	\$237.50	\$238	020-554-0700	97 Bldgs
Rubbish Handling	79	CY	\$13.30	\$1,052	CERL estimate	
Rubbish Hauling	79	CY	\$6.30	\$498	CERL estimate	
Disposal Fees	79	CY	\$6.00	\$475	CERL estimate	
SUBTOTAL				\$14,833		
City cost Index				\$13,899		
TOTAL				\$13,899		
TOTAL with contingency of:	10%			\$15,288		
TOTAL with contingency of:	30%			\$18,068		
ROUNDED TO				\$15,000		
ROUNDED TO				\$18,000		

Table C.4. Peoria-2 - Landscape Peoria Street between Harlow and Colfax (FRA).

Action	Quantity	UOM	Cost/Unit	Total Cost	Means Ref. No.	Book
<i>Install trees and sod</i>						
Hauling of fill	185	CY	\$23.00	\$4,259	022-266-0560	97 Site p. 46
Spread fill material	185	CY	\$1.40	\$259	022-262-0010	97 Site p. 46
Install sod	15	MSF	\$505.00	\$7,575	029-316-0300	97 Site p. 116
Install trees and pit	42	EA	\$100.07	\$4,203	A12.7-421-0000/R029-540	97 Site
Irrigation system	15,000	SF	\$0.61	\$9,150	027-104-0900	97 Site p. 108
<i>removal of chain link fencing</i>						
fabric removal	2,500.00	LF	\$2.52	\$6,300	020-554-0700	98 Fac p. 37
post removal	250.00	EA	\$12.15	\$3,038	020-554-0860	98 Fac p. 37
Rubish Handling	796	CY	\$13.30	\$10,591	CERL estimate	
Rubish Hauling	796	CY	\$6.30	\$5,017	CERL estimate	
Disposal Fees	796	CY	\$6.00	\$4,778	CERL estimate	
<i>Install new entrance</i>						
Hauling of fill	93	CY	\$23.00	\$2,130	022-266-0560	97 Site p. 46
Spread fill material	93	CY	\$1.40	\$130	022-262-0010	97 Site p. 46
Install sod	5	MSF	\$505.00	\$2,525	029-316-0300	97 Site p. 116
Install trees and pit	40	EA	\$100.07	\$4,003	A12.7-421-0000/R029-540	97 Site
Irrigation system	5,000	SF	\$0.61	\$3,050	027-104-0900	97 Site p. 108
Install shrubs	40	Each	\$69.85	\$2,794	S	
Install flowers	100	Each	\$10.00	\$1,000	S	
Install new signs	2	Each	\$2,250.00	\$4,500	104-104-0900	97 Site p. 219
<i>Install new street lights</i>						
Install new street lights	13	EA	\$2,835.00	\$36,855	A12.7-500-2340	98 Site p. 409
<i>Install traffic light foundations</i>						
Excavate foundation for traffic pole	16	CY	\$52.00	\$817	022-250-0300	98 Site p. 48
Install concrete foundation for traffic pole	16	CY	\$305.00	\$4,791	033-130-1500	98 Site p. 145
<i>Install lights</i>						
Install signals programmed	3	intersect	\$44,600.00	\$133,800	028-424-0100	98 Site p. 115
Install traffic turn signals	2	no. inter	\$2,825.00	\$16,950	028-424-0120	98 Site p. 115
Install fully actuated, detectors in all streets/intersection	3	intersect	\$7,975.00	\$23,925	028-424-0300	98 Site p. 115
Install pedestrian push button	3	EA	\$5,850.00	\$17,550	028-424-0400	98 Site p. 115
Install optical programming	3	EA	\$3,650.00	\$10,950	028-424-0500	98 Site p. 116
SUBTOTAL				\$112,155		98 Site p. 116
City cost index	93.7%					
TOTAL				\$105,089		
TOTAL with contingency of:	10%			\$115,598		
TOTAL with contingency of:	30%			\$136,616		
ROUNDED TO				\$116,000		
ROUNDED TO				\$137,000		

Table C.5. Link-1 - Construct Sand Creek Parkway between 26th Avenue and 23rd Street extension (FRA).

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install new road</i>						
Cut soil for new road	14,541	CY	\$1.64	\$23,847	022-242-2000	96 Site&Work
Grade soil	26,173	SY	\$0.72	\$18,845	025-122-1020	98 Site p. 69
Install and compact crushed stone base material	26,173	SY	\$19.15	\$501,219	022-308-0300	98 Site p. 53
Install 4" binder course	26,173	SY	\$6.95	\$181,905	025-104-0200	98 Site p. 67
Install 4" wearing course	26,173	SY	\$8.43	\$220,641	025-104-0340 + 025-104-0460	98 Site p. 68
Compaction of asphalt surface	5,816	CY	\$0.47	\$2,734	025-226-5020	
<i>Paint markings</i>						
Layout of crosswalk	2	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	500	LF	\$1.17	\$585	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	15,100	LF	\$0.04	\$604	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	15,100	LF	\$0.80	\$12,080	025-804-0710	98 Site p. 75
<i>Install new curb & gutter plus catch basin</i>						
Excavate for curb and gutter	877	CY	\$4.97	\$4,359	022-254-0500	97 Site
Install curb and gutter	12,080	LF	\$8.90	\$107,512	025-025-0448	97 Site
Install catch basins	60	EA	\$1,535.00	\$92,100	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	6,644	LF	\$5.30	\$35,213	027-108-3020	97 Site p. 87
<i>Install sidewalks</i>						
Remove existing soil	5,369	SY	\$6.70	\$35,972	020-554-1750	97 Site p. 28
Grade soil	5,369	SY	\$0.72	\$3,866	0225-122-1020	97 Site p. 63
Install sidewalk	6,040	LF	\$13.20	\$79,728	A12.7-140-1580	97 Assemblies p. 421
<i>Install trees and sod next to sidewalk</i>						
Hauling of fill	746	CY	\$23.00	\$17,151	022-266-0560	97 Site p. 46
Spread fill material	746	CY	\$1.40	\$1,044	022-262-0010	97 Site p. 46
Install sod	60	MSF	\$505.00	\$30,300	029-316-0300	97 Site p. 116
Install trees and pit	101	EA	\$100.07	\$10,107	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
<i>Install traffic control directional signs</i>						
Install new signs	4	EA	\$77.50	\$310	028-412-0600 &028-412-1600	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
<i>Install reflective street signs</i>						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
<i>Install street lights</i>						
Install street lights 400 watt	15	EA	\$2,085.00	\$31,275	A12.7-500-2330	
SUBTOTAL				\$1,413,247		\$1,413,247
City cost Index	93.7%					
TOTAL				\$1,324,213		
TOTAL with contingency of:	10%			\$1,456,634		
TOTAL with contingency of:	30%			\$1,721,476		
ROUNDED TO				\$1,457,000		
ROUNDED TO				\$1,721,000		

Table C.6. Link-2 - Construct 1/2 Sand Creek Parkway between N. 10th and 23rd Street extension (North side) (FRA).

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install new road</i>						
Cut soil for new road	2,311	CY	\$1.64	\$3,790	022-242-2000	96 Site&Work
Grade soil	4,160	SY	\$0.72	\$2,995	025-122-1020	98 Site p. 69
Install and compact crushed stone base material	4,160	SY	\$19.15	\$79,664	022-308-0300	98 Site p. 53
Install 4" binder course	4,160	SY	\$6.95	\$28,912	025-104-0200	98 Site p. 67
Install 4" wearing course	4,160	SY	\$8.43	\$35,069	025-104-0340 + 025-104-0460	98 Site p. 68
Compaction of asphalt surface	924	CY	\$0.47	\$434	025-226-5020	
<i>Paint markings</i>						
Layout of crosswalk	2	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	500	LF	\$1.17	\$585	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	2,400	LF	\$0.04	\$96	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	2,400	LF	\$0.80	\$1,920	025-804-0710	98 Site p. 75
<i>Install new curb & gutter plus catch basin</i>						
Excavate for curb and gutter	139	CY	\$4.97	\$693	022-254-0500	97 Site
Install curb and gutter	1,920	LF	\$8.90	\$17,088	025-025-0448	97 Site
Install catch basins	10	EA	\$1,535.00	\$15,350	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	1,056	LF	\$5.30	\$5,597	027-108-3020	97 Site p. 87
<i>Install sidewalks</i>						
Remove existing soil	853	SY	\$6.70	\$5,717	020-554-1750	97 Site p. 28
Grade soil	853	SY	\$0.72	\$614	0225-122-1020	97 Site p. 63
Install sidewalk	960	LF	\$13.20	\$12,672	A12.7-140-1580	97 Assemblies p. 421
<i>Install trees and sod next to sidewalk</i>						
Hauling of fill	119	CY	\$23.00	\$2,726	022-266-0560	97 Site p. 46
Spread fill material	119	CY	\$1.40	\$166	022-262-0010	97 Site p. 46
Install sod	10	MSF	\$505.00	\$5,050	029-316-0300	97 Site p. 116
Install trees and pit	16	EA	\$100.07	\$1,601	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
<i>Install traffic control directional signs</i>						
Install new signs	4	EA	\$77.50	\$310	028-412-0600 & 028-412-1600	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
<i>Install reflective street signs</i>						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
<i>Install street lights</i>						
Install street lights 400 watt	2	EA	\$2,085.00	\$4,170	A12.7-500-2330	
SUBTOTAL						
City cost index	93.7%			\$227,072		
TOTAL				\$212,766		
TOTAL with contingency of:	10%			\$234,043		
TOTAL with contingency of:	30%			\$276,596		
ROUNDED TO				\$234,000		
ROUNDED TO				\$277,000		

Table C.7. Link-3 - Construct Sand Creek Parkway between N. Cooper and 23rd Street extension (FRA).

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install new road</i>						
Cut soil for new road	8,354	CY	\$1.64	\$13,700	022-242-2000	96 Site&Work
Grade soil	15,037	SY	\$0.72	\$10,826	025-122-1020	98 Site p. 69
Install and compact crushed stone base material	15,037	SY	\$19.15	\$287,952	022-308-0300	98 Site p. 53
Install 4" binder course	15,037	SY	\$6.95	\$104,505	025-104-0200	98 Site p. 67
Install 4" wearing course	15,037	SY	\$8.43	\$126,759	025-104-0340 + 025-104-0460	98 Site p. 68
Compaction of asphalt surface	3,341	CY	\$0.47	\$1,570	025-226-5020	
<i>Paint markings</i>						
Layout of crosswalk	2	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	500	LF	\$1.17	\$585	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	8,675	LF	\$0.04	\$347	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	8,675	LF	\$0.80	\$6,940	025-804-0710	98 Site p. 75
<i>Install new curb & gutter plus catch basin</i>						
Excavate for curb and gutter	504	CY	\$4.97	\$2,504	022-254-0500	97 Site
Install curb and gutter	6,940	LF	\$8.90	\$61,766	025-025-0448	97 Site
Install catch basins	35	EA	\$1,535.00	\$53,725	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	3,817	LF	\$5.30	\$20,230	027-108-3020	97 Site p. 87
<i>Install sidewalks</i>						
Remove existing soil	1,542	SY	\$6.70	\$10,333	020-554-1750	97 Site p. 28
Grade soil	1,542	SY	\$0.72	\$1,110	0225-122-1020	97 Site p. 63
Install sidewalk	1,735	LF	\$13.20	\$22,902	A12.7-140-1580	97 Assemblies p. 421
<i>Install trees and sod next to sidewalk</i>						
Hauling of fill	214	CY	\$23.00	\$4,927	022-266-0560	97 Site p. 46
Spread fill material	214	CY	\$1.40	\$300	022-262-0010	97 Site p. 46
Install sod	17	MSF	\$505.00	\$8,585	029-316-0300	97 Site p. 116
Install trees and pit	29	EA	\$100.07	\$2,902	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
<i>Install traffic control directional signs</i>						
Install new signs	4	EA	\$77.50	\$310	028-412-0600 &028-412-1600	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
<i>Install reflective street signs</i>						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
<i>Install street lights</i>						
Install street lights 400 watt	9	EA	\$2,085.00	\$18,765	A12.7-500-2330	
SUBTOTAL				\$763,396		
City cost index				\$715,302		
TOTAL						
TOTAL with contingency of:			10%	\$786,832		
TOTAL with contingency of:			30%	\$929,893		
ROUNDED TO				\$787,000		
ROUNDED TO				\$930,000		

Table C.8. Link-4 - Construct Sand Creek Parkway between Harlow and Cooper (FRA).

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install new road</i>						
Cut soil for new road	5,393	CY	\$1.64	\$8,844	022-242-2000	96 Site&Work
Grade soil	9,707	SY	\$0.72	\$6,989	025-122-1020	98 Site p. 69
Install and compact crushed stone base material	9,707	SY	\$19.15	\$185,883	022-308-0300	98 Site p. 53
Install 4" binder course	9,707	SY	\$6.95	\$67,461	025-104-0200	98 Site p. 67
Install 4" wearing course	9,707	SY	\$8.43	\$81,827	025-104-0340 + 025-104-0460	98 Site p. 68
Compaction of asphalt surface	2,157	CY	\$0.47	\$1,014	025-226-5020	
<i>Paint markings</i>						
Layout of crosswalk	2	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	500	LF	\$1.17	\$585	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	5,600	LF	\$0.04	\$224	025-804-0790	97 Site
Install pavement marking (Thermoplastic paint)	5,600	LF	\$0.80	\$4,480	025-804-0710	98 Site p. 76 98 Site p. 75
<i>Install new curb & gutter plus catch basin</i>						
Excavate for curb and gutter	325	CY	\$4.97	\$1,616	022-254-0500	97 Site
Install curb and gutter	4,480	LF	\$8.90	\$39,872	025-025-0448	97 Site
Install catch basins	22	EA	\$1,535.00	\$33,770	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	2,464	LF	\$5.30	\$13,059	027-108-3020	97 Site p. 87
<i>Install sidewalks</i>						
Remove existing soil	1,991	SY	\$6.70	\$13,340	020-554-1750	97 Site p. 28
Grade soil	1,991	SY	\$0.72	\$1,434	0225-122-1020	97 Site p. 63
Install sidewalk	2,240	LF	\$13.20	\$29,568	A12.7-140-1580	97 Assemblies p. 421
<i>Install trees and sod next to sidewalk</i>						
Hauling of fill	277	CY	\$23.00	\$6,360	022-266-0560	97 Site p. 46
Spread fill material	277	CY	\$1.40	\$387	022-262-0010	97 Site p. 46
Install sod	22	MSF	\$505.00	\$11,110	029-316-0300	97 Site p. 116
Install trees and pit	37	EA	\$100.07	\$3,703	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
<i>Install traffic control directional signs</i>						
Install new signs	4	EA	\$77.50	\$310	028-412-0600 & 028-412-1600	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
<i>Install reflective street signs</i>						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
<i>Install street lights</i>						
Install street lights 400 watt	6	EA	\$2,085.00	\$12,510	A12.7-500-2330	
SUBTOTAL				\$526,199		
City cost index						
TOTAL				\$493,048		
TOTAL with contingency of:				\$542,353		
TOTAL with contingency of:				\$640,963		
ROUNDED TO				<u>\$542,000</u>		
ROUNDED TO				<u>\$641,000</u>		

Table C.9. Link-5 - Construct Sand Creek Parkway between W. Harlow and Charlie Kelly (FRA).

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install new road						
Cut soil for new road	6,789	CY	\$1.64	\$11,134	022-242-2000	96 Site&Work
Grade soil	12,220	SY	\$0.72	\$8,798	025-122-1020	98 Site p. 69
Install and compact crushed stone base material	12,220	SY	\$19.15	\$234,013	022-308-0300	98 Site p. 53
Install 4" binder course	12,220	SY	\$6.95	\$84,929	025-104-0200	98 Site p. 67
Install 4" wearing course	12,220	SY	\$8.43	\$103,015	025-104-0340 + 025-104-0460	98 Site p. 68
Compaction of asphalt surface	2,716	CY	\$0.47	\$1,276	025-226-5020	
Paint markings						
Layout of crosswalk	0	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	0	LF	\$1.17	\$0	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	5,640	LF	\$0.04	\$226	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	5,640	LF	\$0.80	\$4,512	025-804-0710	98 Site p. 75
Install new curb & gutter plus catch basin						
Excavate for curb and gutter	409	CY	\$4.97	\$2,035	022-254-0500	97 Site
Install curb and gutter	5,640	LF	\$8.90	\$50,196	025-025-0448	97 Site
Install catch basins	28	EA	\$1,535.00	\$42,980	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	3,102	LF	\$5.30	\$16,441	027-108-3020	97 Site p. 87
Install sidewalks						
Remove existing soil	2,507	SY	\$6.70	\$16,795	020-554-1750	97 Site p. 28
Grade soil	2,507	SY	\$0.72	\$1,805	0225-122-1020	97 Site p. 63
Install sidewalk	2,820	LF	\$13.20	\$37,224	A12.7-140-1580	97 Assemblies p. 421
Install trees and sod next to sidewalk						
Hauling of fill	348	CY	\$23.00	\$8,007	022-266-0560	97 Site p. 46
Spread fill material	348	CY	\$1.40	\$487	022-262-0010	97 Site p. 46
Install sod	28	MSF	\$505.00	\$14,140	029-316-0300	97 Site p. 116
Install trees and pit	47	EA	\$100.07	\$4,703	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
Install traffic control directional signs						
Install new signs	4	EA	\$77.50	\$310	028-412-0600 &028-412-1600	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
Install reflective street signs						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
Install street lights						
Install street lights 400 watt	7	EA	\$2,085.00	\$14,595	A12.7-500-2330	
SUBTOTAL				\$659,473		
City cost index				\$617,926		
TOTAL						
TOTAL with contingency of:				\$679,719		
TOTAL with contingency of:				\$803,304		
ROUNDED TO				\$680,000		
ROUNDED TO				\$803,000		

Table C.10. Link-6 - Upgrade Potomac to Sand Creek Parkway from Charlie Kelly to Coffax (FRA).

Action	Quantity	UOM	Cost/Unit	Total Cost	Means Ref. No.	Book
<i>Upgrade to Parkway</i>						
<i>Seal existing street</i>						
Sweep and remove debris	52	MSF	\$2.15	\$113	029-710-6420	
Repair potholes & damages (5% of existing)	291	SY	\$12.90	\$3,754	029-710-5913	97 Site p. 119
Repair cracks with flooding (5% of existing)	291	SY	\$4.61	\$1,342	025-458-3320	97 Site p. 119
Slurry Seal road	5,820	SY	\$1.54	\$8,963	025-458-2350	97 Site p. 68
<i>Remove existing sidewalk and curb and gutter</i>						
Remove curb and gutter	0	LF	\$3.91	\$0	020-554-2500	98 Site p. 28
Remove sidewalk	0	SY	\$7.15	\$0	020-254-4200	98 Site p. 28
Rubbish handling	0	CY	\$14.40	\$0	020-620-3080	98 Site p. 29
Haul debris to dump	0	CY	\$12.80	\$0	020-620-5000	98 Site p. 29
Disposal fee for debris	0	CY	\$6.00	\$0		98 Site p. 29
<i>Add 1 new lane, median plus 2 bikeways</i>						
Remove 12" soil	3,772	CY	\$1.64	\$6,186	022-242-2000	
Grade remaining soil	6,790	SY	\$0.58	\$3,938	025-122-0100	96 Site&Work
Install & compact 12" crushed stone base	6,790	SY	\$10.20	\$69,258	022-308-0200	96 Site&Work
Install 4" binder course	6,790	SY	\$6.95	\$47,191	025-104-0200	97 Site p. 48
Install 4" wearing course	6,790	SY	\$8.43	\$57,240	025-104-0340 + 025-104-0460	98 Site p. 67
Compaction of 8" asphalt surface	1,509	CY	\$0.47	\$709	022-226-5020	98 Site p. 68
<i>Paint markings</i>						
Layout of crosswalk	8	LF	\$0.04	\$0	025-804-0790	
Paint crosswalk (Thermoplastic paint)	2,000	LF	\$1.17	\$2,340	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	7,275	LF	\$0.04	\$291	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	7,275	LF	\$0.80	\$5,820	025-804-0710	98 Site p. 75
<i>Install new curb & gutter plus catch basin</i>						
Excavate for curb and gutter	317	CY	\$4.97	\$1,575	022-254-0500	
Install curb and gutter	4,365	LF	\$8.90	\$38,849	025-025-0448	97 Site
Install catch basins	15	EA	\$1,535.00	\$23,025	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	1,601	LF	\$5.30	\$8,483	027-108-3020	97 Site p. 87
<i>Install sidewalks</i>						
Remove existing soil	1,293	SY	\$6.70	\$8,665	020-554-1750	
Grade soil	1,293	SY	\$0.72	\$931	0225-122-1020	97 Site p. 63
Install sidewalk	1,455	LF	\$13.20	\$19,206	A12.7-140-1580	97 Assemblies p. 421
<i>Install trees and sod next to sidewalk</i>						
Hauling of fill	180	CY	\$23.00	\$4,131	022-266-0560	
Spread fill material	180	CY	\$1.40	\$251	022-262-0010	97 Site p. 46
Install sod	15	MSF	\$505.00	\$7,575	029-316-0300	97 Site p. 46
Install trees and pit	24	EA	\$100.07	\$2,402	A12.7-421-0000/R029-540	97 Site p. 116
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
<i>Install traffic control directional signs</i>						
Install new signs	6	EA	\$77.50	\$465	028-412-0600 & 028-412-1600	97 Site
Excavate for new posts	2	CY	\$4.48	\$9	022-254-0060	97 Site
Concrete for new posts	2	CY	\$520.00	\$1,089	033-130-1520	97 Site
<i>Install reflective street signs</i>						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
<i>Install street lights</i>						
Install street lights 400 watt	7	EA	\$2,085.00	\$14,595	A12.7-500-2330	
SUBTOTAL						
City cost index					\$339,515	
TOTAL					\$318,126	
TOTAL with contingency of:					\$349,938	
TOTAL with contingency of:					\$413,564	
ROUNDED TO					\$350,000	
ROUNDED TO					\$414,000	

Table C.11. Link-7 - Upgrade N. Cooper to Sub-Trunk Collector (Harlow to Sand Creek Parkway).

Action	Quantity	UOM	Cost/Unit	Total Cost	Means Ref. No.	Book
Upgrade N. Cooper						
Seal existing street						
Sweep and remove debris	33	MSF	\$2.15	\$70	029-710-6420	97 Site p. 119
Repair potholes & damages (5% of existing)	181	SY	\$12.90	\$2,335	029-710-5913	97 Site p. 119
Repair cracks with flooding (5% of existing)	181	SY	\$4.61	\$834	025-458-3320	97 Site p. 68
Slurry Seal road	3,620	SY	\$1.54	\$5,575	025-458-2350	97 Site p. 68
Remove existing sidewalk and curb and gutter						
Remove curb and gutter	905	LF	\$3.91	\$3,539	020-554-2500	98 Site p. 28
Remove sidewalk	804	SY	\$7.15	\$5,752	020-254-4200	98 Site p. 28
Rubbish handling	254	CY	\$14.40	\$3,651	020-620-3080	98 Site p. 29
Haul debris to dump	254	CY	\$12.80	\$3,245	020-620-5000	98 Site p. 29
Disposal fee for debris	254	CY	\$6.00	\$1,521		
Add 1 new lane plus 2 bikeways						
Remove 12" soil	871	CY	\$1.64	\$1,429	022-242-2000	96 Site&Work
Grade remaining soil	2,614	SY	\$0.58	\$1,516	025-122-0100	96 Site&Work
Install and compact 6" crushed stone base material	2,614	SY	\$10.20	\$26,667	022-308-0200	97 Site p. 48
Install 3" binder course	2,614	SY	\$5.30	\$13,857	025-104-0160	96 Site&Work
Install 3" wearing course	2,614	SY	\$6.15	\$16,079	025-104-0460	96 Site&Work
Compaction of 6" asphalt surface	436	CY	\$0.47	\$205	022-226-5020	96 Site&Work
Paint markings						
Layout of crosswalk	3	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	750	LF	\$1.17	\$878	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	4,525	LF	\$0.04	\$181	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	4,525	LF	\$0.80	\$3,620	025-804-0710	98 Site p. 75
Install new curb & gutter plus catch basin						
Excavate for curb and gutter	131	CY	\$4.97	\$653	022-254-0500	97 Site
Install curb and gutter	1,810	LF	\$8.90	\$16,109	025-025-0448	97 Site
Install catch basins	18	EA	\$1,535.00	\$27,630	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	1,991	LF	\$5.30	\$10,552	027-108-3020	97 Site p. 87
Install sidewalks						
Remove existing soil	1,207	SY	\$6.70	\$8,085	020-554-1750	97 Site p. 28
Grade soil	1,207	SY	\$0.72	\$869	0225-122-1020	97 Site p. 63
Install sidewalk	1,810	LF	\$13.20	\$23,892	A12.7-140-1580	97 Assemblies p. 421
Install trees and sod next to sidewalk						
Hauling of fill	156	CY	\$23.00	\$3,598	022-266-0560	97 Site p. 46
Spread fill material	156	CY	\$1.40	\$219	022-262-0010	97 Site p. 46
Install sod	13	MSF	\$505.00	\$6,565	029-316-0300	97 Site p. 116
Install trees and pit	30	EA	\$100.07	\$3,002	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
Install traffic control directional signs						
Install new signs	6	EA	\$77.50	\$465	028-412-0600 &028-412-1600	97 Site
Excavate for new posts	2	CY	\$4.48	\$9	022-254-0060	97 Site
Concrete for new posts	2	CY	\$520.00	\$1,089	033-130-1520	97 Site
Install reflective street signs						
Install new signs	6	EA	\$97.00	\$582	104-304-4900	97 Site
Excavate for new posts	2	CY	\$4.48	\$9	022-254-0060	97 Site
Concrete for new posts	2	CY	\$520.00	\$1,089	033-130-1520	97 Site
Install street lights						
Install street lights 400 watt	5	EA	\$2,085.00	\$10,425	A12.7-500-2330	
SUBTOTAL				\$205,795		
City cost index						
TOTAL				\$192,830		
TOTAL with contingency of:				\$212,113		
TOTAL with contingency of:				\$250,679		
ROUNDED TO				\$212,000		
ROUNDED TO				\$251,000		

Table C.12. Link-8 - Upgrade N. 10th Street to Sub-Trunk Collector (Harlow to Sand Creek Parkway).

Action	Quantity	UOM	Cost/Unit	Total Cost	Means Ref. No.	Book
Upgrade N. 10th						
Seal existing street						
Sweep and remove debris	39	MSF	\$2.15	\$84	029-710-6420	97 Site p. 119
Repair potholes & damages (5% of existing)	216	SY	\$12.90	\$2,786	029-710-5913	97 Site p. 119
Repair cracks with flooding (5% of existing)	216	SY	\$4.61	\$996	025-458-3320	97 Site p. 68
Slurry Seal road	4,320	SY	\$1.54	\$6,653	025-458-2350	97 Site p. 68
Remove existing sidewalk and curb and gutter						
Remove curb and gutter	1,080	LF	\$3.91	\$4,223	020-554-2500	98 Site p. 28
Remove sidewalk	960	SY	\$7.15	\$6,864	020-254-4200	98 Site p. 28
Rubbish handling	303	CY	\$14.40	\$4,357	020-620-3080	98 Site p. 29
Haul debris to dump	303	CY	\$12.80	\$3,873	020-620-5000	98 Site p. 29
Disposal fee for debris	303	CY	\$6.00	\$1,815		
Add 1 new lane plus 2 bikeways						
Remove 12" soil	1,040	CY	\$1.64	\$1,706	022-242-2000	96 Site&Work
Grade remaining soil	3,120	SY	\$0.58	\$1,810	025-122-0100	96 Site&Work
Install and compact 6" crushed stone base material	3,120	SY	\$10.20	\$31,824	022-308-0200	97 Site p. 48
Install 3" binder course	3,120	SY	\$5.30	\$16,536	025-104-0160	96 Site&Work
Install 3" wearing course	3,120	SY	\$6.15	\$19,188	025-104-0460	96 Site&Work
Compaction of 6" asphalt surface	520	CY	\$0.47	\$244	022-226-5020	96 Site&Work
Paint markings						
Layout of crosswalk	4	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	1,000	LF	\$1.17	\$1,170	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	5,400	LF	\$0.04	\$216	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	5,400	LF	\$0.80	\$4,320	025-804-0710	98 Site p. 75
Install new curb & gutter plus catch basin						
Excavate for curb and gutter	157	CY	\$4.97	\$773	022-254-0500	97 Site
Install curb and gutter	2,160	LF	\$8.90	\$19,224	025-025-0448	97 Site
Install catch basins	22	EA	\$1,535.00	\$33,770	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	2,376	LF	\$5.30	\$12,593	027-108-3020	97 Site p. 87
Install sidewalks						
Remove existing soil	1,440	SY	\$6.70	\$9,648	020-554-1750	97 Site p. 28
Grade soil	1,440	SY	\$0.72	\$1,037	0225-122-1020	97 Site p. 63
Install sidewalk	2,160	LF	\$13.20	\$28,512	A12.7-140-1580	97 Assemblies p. 421
Install trees and sod next to sidewalk						
Hauling of fill	187	CY	\$23.00	\$4,293	022-266-0560	97 Site p. 46
Spread fill material	187	CY	\$1.40	\$261	022-262-0010	97 Site p. 46
Install sod	15	MSF	\$505.00	\$7,575	029-316-0300	97 Site p. 116
Install trees and pit	36	EA	\$100.07	\$3,603	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
Install traffic control directional signs						
Install new signs	8	EA	\$77.50	\$620	028-412-0600 & 028-412-1600	97 Site
Excavate for new posts	3	CY	\$4.48	\$13	022-254-0060	97 Site
Concrete for new posts	3	CY	\$520.00	\$1,451	033-130-1520	97 Site
Install reflective street signs						
Install new signs	8	EA	\$97.00	\$776	104-304-4900	97 Site
Excavate for new posts	3	CY	\$4.48	\$13	022-254-0060	97 Site
Concrete for new posts	3	CY	\$520.00	\$1,451	033-130-1520	97 Site
Install street lights						
Install street lights 400 watt	5	EA	\$2,085.00	\$10,425	A12.7-500-2330	
SUBTOTAL						
City cost index	93.7%			\$244,708		
TOTAL				\$229,291		
TOTAL with contingency of:	10%			\$252,221		
TOTAL with contingency of:	30%			\$298,079		
ROUNDED TO				\$252,000		
ROUNDED TO				\$298,000		

Table C.13. Link-9 - Extend new 23rd Street connector from new golf road (Link-18) to Sand Creek Parkway.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Existing road removal						
Demolition						
Remove top soil	360	CY	\$0.93	\$335	029-204-1400	98 Site p. 116
Remove existing road	1,080	SY	\$6.10	\$6,588	020-554-1750	98 Site p. 28
Rubbish handling	600	CY	\$14.40	\$8,640	020-620-3080	98 Site p. 29
Haul debris to dump	600	CY	\$12.80	\$7,680	020-620-5000	98 Site p. 29
Disposal fee for debris	600	CY	\$6.00	\$3,600		
		Total			\$26,843	
New road construction						
Install new road						
Cut soil for new road	1,910	CY	\$1.64	\$3,132	022-242-2000	96 Site & Work
Grade soil	0	SY	\$0.72	\$0	025-122-1020	98 Site p. 69
Install and compact crushed stone base material	0	SY	\$19.15	\$0	022-308-0300	98 Site p. 53
Install 4" binder course	2,790	SY	\$6.95	\$19,391	025-104-0200	98 Site p. 67
Install 4" wearing course	2,790	SY	\$8.43	\$23,520	025-104-0340 + 025-104-0460	98 Site p. 68
Compaction of asphalt surface	620	CY	\$0.47	\$291	025-226-5020	
		Total			\$46,334	
Paint markings						
Layout of crosswalk	2	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	500	LF	\$1.17	\$585	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	2,025	LF	\$0.04	\$81	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	2,025	LF	\$0.80	\$1,620	025-804-0710	98 Site p. 75
		Total			\$2,286	
Install new curb & gutter plus catch basin						
Excavate for curb and gutter	59	CY	\$4.97	\$292	022-254-0500	97 Site
Install curb and gutter	810	LF	\$8.90	\$7,209	025-025-0448	97 Site
Install catch basins	8	EA	\$1,535.00	\$12,280	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	891	LF	\$5.30	\$4,722	027-108-3020	97 Site p. 87
		Total			\$24,504	
Install sidewalks						
Remove existing soil	540	SY	\$6.70	\$3,618	020-554-1750	97 Site p. 28
Grade soil	540	SY	\$0.72	\$385	0225-122-1020	97 Site p. 63
Install sidewalk	810	LF	\$13.20	\$10,692	A12.7-140-1580	97 Assemblies p. 421
		Total			\$14,699	
Install trees and sod next to sidewalk						
Hauling of fill	70	CY	\$23.00	\$1,610	022-266-0560	97 Site p. 46
Spread fill material	70	CY	\$1.40	\$98	022-262-0010	97 Site p. 46
Install sod	6	MSF	\$505.00	\$3,030	029-316-0300	97 Site p. 116
Install trees and pit	14	EA	\$100.07	\$1,401	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
		Total			\$6,139	
Install traffic control directional signs						
Install new signs	4	EA	\$77.50	\$310	028-412-0600 & 028-412-1600	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
		Total			\$1,042	
Install reflective street signs						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
		Total			\$1,120	
Install street lights						
Install street lights 400 watt	2	EA	\$2,085.00	\$4,170	A12.7-500-2330	
		Total			\$4,170	
SUBTOTAL					\$127,136	
City cost index		93.7%				
TOTAL					\$119,127	
TOTAL with contingency of:		10%			\$131,039	
TOTAL with contingency of:		30%			\$154,864	
ROUNDED TO					\$131,000	
ROUNDED TO					\$155,000	

Table C.14. Link-10 - Construct 23rd Street connector to new golf road (Link-18).

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install new road						
Cut soil for new road	7,501	CY	\$1.64	\$12,302	022-242-2000	96 Site&Work
Grade soil	13,502	SY	\$0.72	\$9,722	025-122-1020	98 Site p. 69
Install and compact crushed stone base material	13,502	SY	\$19.15	\$258,568	022-308-0300	98 Site p. 53
Install 4" binder course	13,502	SY	\$6.95	\$93,840	025-104-0200	98 Site p. 67
Install 4" wearing course	13,502	SY	\$8.43	\$113,824	025-104-0340 + 025-104-0460	98 Site p. 68
Compaction of asphalt surface	3,000	CY	\$0.47	\$1,410	025-226-5020	
	Total				\$489,666	
Paint markings						
Layout of crosswalk	2	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	500	LF	\$1.17	\$585	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	9,800	LF	\$0.04	\$392	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	9,800	LF	\$0.80	\$7,840	025-804-0710	98 Site p. 75
	Total				\$8,817	
Install new curb & gutter plus catch basin						
Excavate for curb and gutter	285	CY	\$4.97	\$1,414	022-254-0500	97 Site
Install curb and gutter	3,920	LF	\$8.90	\$34,888	025-025-0448	97 Site
Install catch basins	39	EA	\$1,535.00	\$59,865	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	4,312	LF	\$5.30	\$22,854	027-108-3020	97 Site p. 87
	Total				\$119,021	
Install sidewalks						
Remove existing soil	2,613	SY	\$6.70	\$17,509	020-554-1750	97 Site p. 28
Grade soil	2,613	SY	\$0.72	\$1,882	0225-122-1020	97 Site p. 63
Install sidewalk	3,920	LF	\$13.20	\$51,744	A12.7-140-1580	97 Assemblies p. 421
	Total				\$71,135	
Install trees and sod next to sidewalk						
Hauling of fill	339	CY	\$23.00	\$7,792	022-266-0560	97 Site p. 46
Spread fill material	339	CY	\$1.40	\$474	022-262-0010	97 Site p. 46
Install sod	27	MSF	\$505.00	\$13,635	029-316-0300	97 Site p. 116
Install trees and pit	65	EA	\$100.07	\$6,505	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
	Total				\$28,405	
Install traffic control directional signs						
Install new signs	4	EA	\$77.50	\$310	028-412-0600 &028-412-1600	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
	Total				\$1,042	
Install reflective street signs						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
	Total				\$1,120	
Install street lights						
Install street lights 400 watt	10	EA	\$2,085.00	\$20,850	A12.7-500-2330	
	Total				\$20,850	
SUBTOTAL					\$740,056	
City cost Index						
TOTAL					\$693,432	
TOTAL with contingency of:					\$762,776	
TOTAL with contingency of:					\$901,462	
ROUNDED TO					\$763,000	
ROUNDED TO					\$901,000	

Table C.15. Link-11 - Upgrade Charlie Kelly from Van Valzah to Potomac and Sand Creek Parkway.

Action	Quantity	UOM	Cost/Unit	Total Cost	Means Ref. No.	Book
Charlie Kelly from Valzah to Sand Creek Pkwy						
Seal existing street						
Sweep and remove debris	35	MSF	\$2.15	\$74	029-710-6420	97 Site p. 119
Repair potholes & damages (5% of existing)	192	SY	\$12.90	\$2,477	029-710-5913	97 Site p. 119
Repair cracks with flooding (5% of existing)	192	SY	\$4.61	\$885	025-458-3320	97 Site p. 68
Slurry Seal road	3,840	SY	\$1.54	\$5,914	025-458-2350	97 Site p. 68
				\$9,350		
Remove existing sidewalk and curb and gutter						
Remove curb and gutter	960	LF	\$3.91	\$3,754	020-554-2500	98 Site p. 28
Remove sidewalk	853	SY	\$7.15	\$6,101	020-254-4200	98 Site p. 28
Rubbish handling	269	CY	\$14.40	\$3,873	020-620-3080	98 Site p. 29
Haul debris to dump	269	CY	\$12.80	\$3,442	020-620-5000	98 Site p. 29
Disposal fee for debris	269	CY	\$6.00	\$1,614		
				\$18,784		
Add 1 new lane plus 2 bikeways						
Remove 12" soil	356	CY	\$1.64	\$583	022-242-2000	96 Site&Work
Grade remaining soil	1,067	SY	\$0.58	\$619	025-122-0100	96 Site&Work
Install and compact 6" crushed stone base material	1,067	SY	\$10.20	\$10,880	022-308-0200	97 Site p. 48
Install 3" binder course	1,067	SY	\$5.30	\$5,653	025-104-0160	96 Site&Work
Install 3" wearing course	1,067	SY	\$6.15	\$6,560	025-104-0460	96 Site&Work
Compaction of 6" asphalt surface	178	CY	\$0.47	\$84	022-226-5020	96 Site&Work
				\$24,379		
Paint markings						
Layout of crosswalk	2	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	500	LF	\$1.17	\$585	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	4,800	LF	\$0.04	\$192	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	4,800	LF	\$0.80	\$3,840	025-804-0710	98 Site p. 75
				\$4,617		
Install new curb & gutter plus catch basin						
Excavate for curb and gutter	139	CY	\$4.97	\$693	022-254-0500	97 Site
Install curb and gutter	1,920	LF	\$8.90	\$17,088	025-025-0448	97 Site
Install catch basins	19	EA	\$1,535.00	\$29,165	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	2,112	LF	\$5.30	\$11,194	027-108-3020	97 Site p. 87
				\$58,139		
Install sidewalks						
Remove existing soil	1,280	SY	\$6.70	\$8,576	020-554-1750	97 Site p. 28
Grade soil	1,280	SY	\$0.72	\$922	0225-122-1020	97 Site p. 63
Install sidewalk	1,920	LF	\$13.20	\$25,344	A12.7-140-1580	97 Assemblies p. 421
				\$34,842		
Install trees and sod next to sidewalk						
Hauling of fill	166	CY	\$23.00	\$3,816	022-266-0560	97 Site p. 46
Spread fill material	166	CY	\$1.40	\$232	022-262-0010	97 Site p. 46
Install sod	13	MSF	\$505.00	\$6,565	029-316-0300	97 Site p. 116
Install trees and pit	32	EA	\$100.07	\$3,202	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
				\$13,816		
Install traffic control directional signs						
Install new signs	4	EA	\$77.50	\$310	028-412-0600 & 028-412-1600	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
				\$1,042		
Install reflective street signs						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
				\$1,120		
Install street lights						
Install street lights 400 watt	5	EA	\$2,085.00	\$10,425	A12.7-500-2330	
				\$10,425		
SUBTOTAL						
City cost Index						
TOTAL						
TOTAL with contingency of:			10%		\$181,932	
TOTAL with contingency of:			30%		\$215,011	
ROUNDED TO					\$182,000	
ROUNDED TO					\$215,000	

Table C.16. - Link-12 - Extend Harlow from Van Valzah to Sand Creek Parkway.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Existing road removal</i>						
Demolition						
Remove top soil	250	CY	\$0.93	\$233	029-204-1400	
Remove existing road	750	SY	\$6.10	\$4,575	020-554-1750	98 Site p. 116
Rubbish handling	417	CY	\$14.40	\$6,000	020-620-3080	98 Site p. 28
Haul debris to dump	417	CY	\$12.80	\$5,333	020-620-5000	98 Site p. 29
Disposal fee for debris	417	CY	\$6.00	\$2,500		98 Site p. 29
					\$18,641	
<i>New road construction</i>						
<i>Install new road</i>						
Cut soil for new road	537	CY	\$1.64	\$881	022-242-2000	
Grade soil	0	SY	\$0.72	\$0	025-122-1020	96 Site&Work
Install and compact crushed stone base material	0	SY	\$19.15	\$0	022-308-0300	98 Site p. 69
Install 4" binder course	2,411	SY	\$6.95	\$16,757	025-104-0200	98 Site p. 53
Install 4" wearing course	2,411	SY	\$8.43	\$20,326	025-104-0340 + 025-104-0460	98 Site p. 67
Compaction of asphalt surface	536	CY	\$0.47	\$252	025-226-5020	98 Site p. 68
					\$38,215	
<i>Paint markings</i>						
Layout of crosswalk	1	LF	\$0.04	\$0	025-804-0790	
Paint crosswalk (Thermoplastic paint)	250	LF	\$1.17	\$283	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	1,750	LF	\$0.04	\$70	025-804-0790	97 Site
Install pavement marking (Thermoplastic paint)	1,750	LF	\$0.80	\$1,400	025-804-0710	98 Site p. 76
					\$1,763	98 Site p. 75
<i>Install new curb & gutter plus catch basin</i>						
Excavate for curb and gutter	51	CY	\$4.97	\$253	022-254-0500	
Install curb and gutter	700	LF	\$8.90	\$6,230	025-025-0448	97 Site
Install catch basins	7	EA	\$1,535.00	\$10,745	A12.3-710-5820	97 Site
Install pipe to connect basins	770	LF	\$5.30	\$4,081	027-108-3020	97 Site p. 365
					\$21,309	97 Site p. 87
<i>Install sidewalks</i>						
Remove existing soil	467	SY	\$6.70	\$3,127	020-554-1750	
Grade soil	467	SY	\$0.72	\$336	022-122-1020	97 Site p. 28
Install sidewalk	700	LF	\$13.20	\$9,240	A12.7-140-1580	97 Site p. 63
					\$12,703	97 Assemblies p. 421
<i>Install trees and sod next to sidewalk</i>						
Hauling of fill	60	CY	\$23.00	\$1,391	022-266-0560	
Spread fill material	60	CY	\$1.40	\$85	022-262-0010	97 Site p. 46
Install sod	5	MSF	\$505.00	\$2,525	029-316-0300	97 Site p. 46
Install trees and pit	12	EA	\$100.07	\$1,201	A12.7-421-0000/R029-540	97 Site p. 116
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site
					\$5,202	97 Site p. 108
<i>Install traffic control directional signs</i>						
Install new signs	4	EA	\$77.50	\$310	028-412-0600 & 028-412-1600	
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
					\$1,042	
<i>Install reflective street signs</i>						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
					\$1,120	97 Site
<i>Install street lights</i>						
Install street lights 400 watt	2	EA	\$2,085.00	\$4,170	A12.7-500-2330	
					\$4,170	
SUBTOTAL						
City cost index					\$104,164	
TOTAL					\$97,602	
TOTAL with contingency of:					\$107,362	
TOTAL with contingency of:					\$126,882	
ROUNDED TO					\$107,000	
ROUNDED TO					\$127,000	

Table C.17. Link-13 - Widen Harlow from N. Cooper to Van Valzah.

Action	Quantity	UOM	Cost/Unit	Total Cost	Means Ref. No.	Book
Hutton from N. Cooper to Van Valzah						
Seal existing street						
Sweep and remove debris	13	MSF	\$2.15	\$28	029-710-6420	97 Site p. 119
Repair potholes & damages (5% of existing)	72	SY	\$12.90	\$929	029-710-5913	97 Site p. 119
Repair cracks with flooding (5% of existing)	72	SY	\$4.61	\$332	025-458-3320	97 Site p. 68
Slurry Seal road	1,440	SY	\$1.54	\$2,218	025-458-2350	97 Site p. 68
					\$3,506	
Remove existing sidewalk and curb and gutter						
Remove curb and gutter	540	LF	\$3.91	\$2,111	020-554-2500	98 Site p. 28
Remove sidewalk	480	SY	\$7.15	\$3,432	020-254-4200	98 Site p. 28
Rubbish handling	151	CY	\$14.40	\$2,178	020-620-3080	98 Site p. 29
Haul debris to dump	151	CY	\$12.80	\$1,936	020-620-5000	98 Site p. 29
Disposal fee for debris	151	CY	\$6.00	\$908		
					\$10,566	
Add 1 new lane plus 2 bikeways						
Remove 12" soil	760	CY	\$1.64	\$1,246	022-242-2000	96 Site&Work
Grade remaining soil	2,280	SY	\$0.58	\$1,322	025-122-0100	96 Site&Work
Install and compact 6" crushed stone base material	2,280	SY	\$10.20	\$23,256	022-308-0200	97 Site p. 48
Install 3" binder course	2,280	SY	\$5.30	\$12,084	025-104-0160	96 Site&Work
Install 3" wearing course	2,280	SY	\$6.15	\$14,022	025-104-0460	96 Site&Work
Compaction of 6" asphalt surface	380	CY	\$0.47	\$179	022-226-5020	96 Site&Work
					\$52,109	
Paint markings						
Layout of crosswalk	8	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	2,000	LF	\$1.17	\$2,340	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	2,700	LF	\$0.04	\$108	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	2,700	LF	\$0.80	\$2,160	025-804-0710	98 Site p. 75
					\$4,608	
Install new curb & gutter plus catch basin						
Excavate for curb and gutter	78	CY	\$4.97	\$390	022-254-0500	97 Site
Install curb and gutter	1,080	LF	\$8.90	\$9,612	025-025-0448	97 Site
Install catch basins	11	EA	\$1,535.00	\$16,885	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	1,188	LF	\$5.30	\$6,296	027-108-3020	97 Site p. 87
					\$33,183	
Install sidewalks						
Remove existing soil	720	SY	\$6.70	\$4,824	020-554-1750	97 Site p. 28
Grade soil	720	SY	\$0.72	\$518	022-122-1020	97 Site p. 63
Install sidewalk	1,080	LF	\$13.20	\$14,256	A12.7-140-1580	97 Assemblies p. 421
					\$19,598	
Install trees and sod next to sidewalk						
Hauling of fill	93	CY	\$23.00	\$2,147	022-266-0560	97 Site p. 46
Spread fill material	93	CY	\$1.40	\$131	022-262-0010	97 Site p. 46
Install sod	8	MSF	\$505.00	\$4,040	029-316-0300	97 Site p. 116
Install trees and pit	18	EA	\$100.07	\$1,801	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
					\$8,119	
Install traffic control directional signs						
Install new signs	4	EA	\$77.50	\$310	028-412-0600 & 028-412-1600	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
					\$1,042	
Install reflective street signs						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
					\$1,120	
Install street lights						
Install street lights 400 watt	3	EA	\$2,085.00	\$6,255	A12.7-500-2330	
					\$6,255	
SUBTOTAL					\$140,107	
City cost Index						
TOTAL					\$131,280	
TOTAL with contingency of:					\$144,408	
TOTAL with contingency of:					\$170,664	
ROUNDED TO					\$144,000	
ROUNDED TO					\$171,000	

Table C.18. Link-15 - Widen Harlow from new golf course road (Link-18) to N. 10th Street.

Action	Quantity	UOM	Cost/Unit	Total Cost	Means Ref. No.	Book
<i>West Gate to Hutton (after gate building removal)</i>						
<i>Seal existing street</i>						
Sweep and remove debris	47	MSF	\$2.15	\$100	029-710-6420	
Repair potholes & damages (5% of existing)	258	SY	\$12.90	\$3,333	029-710-5913	97 Site p. 119
Repair cracks with flooding (5% of existing)	258	SY	\$4.61	\$1,191	025-458-3320	97 Site p. 119
Slurry Seal road	5,167	SY	\$1.54	\$7,957	025-458-2350	97 Site p. 68
						97 Site p. 68
<i>Remove existing sidewalk and curb and gutter</i>						
Remove curb and gutter	1,500	LF	\$3.91	\$5,865	020-554-2500	
Remove sidewalk	1,333	SY	\$7.15	\$9,533	020-254-4200	98 Site p. 28
Rubbish handling	420	CY	\$14.40	\$6,051	020-620-3080	98 Site p. 28
Haul debris to dump	420	CY	\$12.80	\$5,379	020-620-5000	98 Site p. 29
Disposal fee for debris	420	CY	\$6.00	\$2,521		98 Site p. 29
<i>Add 1 new lane plus 2 bikeways</i>						
Remove 12" soil	1,722	CY	\$1.64	\$2,824	022-242-2000	
Grade remaining soil	5,167	SY	\$0.58	\$2,997	025-122-0100	96 Site&Work
Install and compact 6" crushed stone base material	5,167	SY	\$10.20	\$52,700	022-308-0200	96 Site&Work
Install 3" binder course	5,167	SY	\$5.30	\$27,383	025-104-0160	97 Site p. 48
Install 3" wearing course	5,167	SY	\$6.15	\$31,775	025-104-0460	96 Site&Work
Compaction of 6" asphalt surface	861	CY	\$0.47	\$405	022-226-5020	96 Site&Work
						96 Site&Work
<i>Paint markings</i>						
Layout of crosswalk	8	LF	\$0.04	\$0	025-804-0790	
Paint crosswalk (Thermoplastic paint)	2,000	LF	\$1.17	\$2,340	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	7,500	LF	\$0.04	\$300	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	7,500	LF	\$0.80	\$6,000	025-804-0710	98 Site p. 75
<i>Install new curb & gutter plus catch basin</i>						
Excavate for curb and gutter	218	CY	\$4.97	\$1,082	022-254-0500	
Install curb and gutter	3,000	LF	\$8.90	\$26,700	025-025-0448	97 Site
Install catch basins	30	EA	\$1,535.00	\$46,050	A12.3-710-5820	97 Site
Install pipe to connect basins	3,300	LF	\$5.30	\$17,490	027-108-3020	97 Site p. 365
						97 Site p. 87
<i>Install sidewalks</i>						
Remove existing soil	2,000	SY	\$6.70	\$13,400	020-554-1750	
Grade soil	2,000	SY	\$0.72	\$1,440	0225-122-1020	97 Site p. 28
Install sidewalk	3,000	LF	\$13.20	\$39,600	A12.7-140-1580	97 Site p. 63
						97 Assemblies p. 421
<i>Install trees and sod next to sidewalk</i>						
Hauling of fill	259	CY	\$23.00	\$5,963	022-266-0560	
Spread fill material	259	CY	\$1.40	\$363	022-262-0010	97 Site p. 46
Install sod	21	MSF	\$505.00	\$10,605	029-316-0300	97 Site p. 46
Install trees and pit	50	EA	\$100.07	\$5,004	A12.7-421-0000/R029-540	97 Site p. 115
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site
						97 Site p. 108
<i>Install traffic control directional signs</i>						
Install new signs	6	EA	\$77.50	\$465	028-412-0600 & 028-412-1600	
Excavate for new posts	2	CY	\$4.48	\$9	022-254-0060	97 Site
Concrete for new posts	2	CY	\$520.00	\$1,089	033-130-1520	97 Site
<i>Install reflective street signs</i>						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
<i>Install street lights</i>						
Install street lights 400 watt	8	EA	\$2,085.00	\$16,680	A12.7-500-2330	
SUBTOTAL						
City cost Index				\$355,714		
TOTAL				\$333,304		
TOTAL with contingency of:						
TOTAL with contingency of:				\$366,634		
10%				\$433,295		
30%						
ROUNDED TO				\$367,000		
ROUNDED TO				\$433,000		

Table C.19. Link-16 - Widen Harlow from S. Hutton to new golf course road (Link-18).

Action	Quantity	UOM	Cost/Unit	Total Cost	Means Ref. No.	Book
West Gate to Hutton (after gate building removal)						
Seal existing street						
Sweep and remove debris	14	MSF	\$2.15	\$30	029-710-6420	97 Site p. 119
Repair potholes & damages (5% of existing)	78	SY	\$12.90	\$1,000	029-710-5913	97 Site p. 119
Repair cracks with flooding (5% of existing)	78	SY	\$4.61	\$357	025-458-3320	97 Site p. 68
Slurry Seal road	1,550	SY	\$1.54	\$2,387	025-458-2350	97 Site p. 68
					\$3,774	
Remove existing sidewalk and curb and gutter						
Remove curb and gutter	450	LF	\$3.91	\$1,760	020-554-2500	98 Site p. 28
Remove sidewalk	400	SY	\$7.15	\$2,860	020-254-4200	98 Site p. 28
Rubbish handling	126	CY	\$14.40	\$1,815	020-620-3080	98 Site p. 29
Haul debris to dump	126	CY	\$12.80	\$1,614	020-620-5000	98 Site p. 29
Disposal fee for debris	126	CY	\$6.00	\$756		
					\$8,805	
Add 1 new lane plus 2 bikeways						
Remove 12" soil	517	CY	\$1.64	\$847	022-242-2000	96 Site&Work
Grade remaining soil	1,550	SY	\$0.58	\$899	025-122-0100	96 Site&Work
Install and compact 6" crushed stone base material	1,550	SY	\$10.20	\$15,810	022-308-0200	97 Site p. 48
Install 3" binder course	1,550	SY	\$5.30	\$8,215	025-104-0160	96 Site&Work
Install 3" wearing course	1,550	SY	\$6.15	\$9,533	025-104-0460	96 Site&Work
Compaction of 6" asphalt surface	258	CY	\$0.47	\$121	022-226-5020	96 Site&Work
					\$35,425	
Paint markings						
Layout of crosswalk	4	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	1,000	LF	\$1.17	\$1,170	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	2,250	LF	\$0.04	\$90	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	2,250	LF	\$0.80	\$1,800	025-804-0710	98 Site p. 75
					\$3,060	
Install new curb & gutter plus catch basin						
Excavate for curb and gutter	65	CY	\$4.97	\$325	022-254-0500	97 Site
Install curb and gutter	900	LF	\$8.90	\$8,010	025-025-0448	97 Site
Install catch basins	9	EA	\$1,535.00	\$13,815	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	990	LF	\$5.30	\$5,247	027-108-3020	97 Site p. 87
					\$27,397	
Install sidewalks						
Remove existing soil	600	SY	\$6.70	\$4,020	020-554-1750	97 Site p. 28
Grade soil	600	SY	\$0.72	\$432	022-122-1020	97 Site p. 63
Install sidewalk	900	LF	\$13.20	\$11,880	A12.7-140-1580	97 Assemblies p. 421
					\$16,332	
Install trees and sod next to sidewalk						
Hauling of fill	78	CY	\$23.00	\$1,789	022-266-0560	97 Site p. 46
Spread fill material	78	CY	\$1.40	\$109	022-262-0010	97 Site p. 46
Install sod	6	MSF	\$505.00	\$3,030	029-316-0300	97 Site p. 116
Install trees and pit	15	EA	\$100.07	\$1,501	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
					\$6,429	
Install traffic control directional signs						
Install new signs	6	EA	\$77.50	\$465	028-412-0600 &028-412-1600	97 Site
Excavate for new posts	2	CY	\$4.48	\$9	022-254-0060	97 Site
Concrete for new posts	2	CY	\$520.00	\$1,089	033-130-1520	97 Site
					\$1,563	
Install reflective street signs						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
					\$1,120	
Install street lights						
Install street lights 400 watt	2	EA	\$2,085.00	\$4,170	A12.7-500-2330	
					\$4,170	
SUBTOTAL					\$108,075	
City cost index						
TOTAL					\$101,266	
TOTAL with contingency of:					\$111,393	
TOTAL with contingency of:					\$131,646	
ROUNDED TO					\$111,000	
ROUNDED TO					\$132,000	

Table C.20. Link-17 - Widen Harlow from West Gate to S. Hutton.

Action	Quantity	UOM	Cost/Unit	Total Cost	Means Ref. No.	Book
<i>West Gate to Hutton (after gate building removal)</i>						
<i>Seal existing street</i>						
Sweep and remove debris	22	MSF	\$2.15	\$46	029-710-6420	
Repair potholes & damages (5% of existing)	120	SY	\$12.90	\$1,548	029-710-5913	97 Site p. 119
Repair cracks with flooding (5% of existing)	120	SY	\$4.61	\$553	025-458-3320	97 Site p. 119
Slurry Seal road	2,400	SY	\$1.54	\$3,696	025-458-2350	97 Site p. 68
					\$5,844	97 Site p. 68
<i>Remove existing sidewalk and curb and gutter</i>						
Remove curb and gutter	450	LF	\$3.91	\$1,760	020-554-2500	
Remove sidewalk	400	SY	\$7.15	\$2,860	020-254-4200	98 Site p. 28
Rubbish handling	126	CY	\$14.40	\$1,815	020-620-3080	98 Site p. 28
Haul debris to dump	126	CY	\$12.80	\$1,614	020-620-5000	98 Site p. 29
Disposal fee for debris	126	CY	\$6.00	\$756		98 Site p. 29
					\$8,805	
<i>Add 1 new lane plus 2 bikeways</i>						
Remove 12" soil	400	CY	\$1.64	\$656	022-242-2000	
Grade remaining soil	1,200	SY	\$0.58	\$696	025-122-0100	96 Site&Work
Install and compact 6" crushed stone base material	1,200	SY	\$10.20	\$12,240	022-308-0200	96 Site&Work
Install 3" binder course	1,200	SY	\$5.30	\$6,360	025-104-0160	97 Site p. 48
Install 3" wearing course	1,200	SY	\$6.15	\$7,380	025-104-0460	96 Site&Work
Compaction of 6" asphalt surface	200	CY	\$0.47	\$94	022-226-5020	96 Site&Work
					\$27,426	
<i>Paint markings</i>						
Layout of crosswalk	1	LF	\$0.04	\$0	025-804-0790	
Paint crosswalk (Thermoplastic paint)	250	LF	\$1.17	\$293	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	2,250	LF	\$0.04	\$90	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	2,250	LF	\$0.80	\$1,800	025-804-0710	98 Site p. 75
					\$2,183	
<i>Install new curb & gutter plus catch basin</i>						
Excavate for curb and gutter	65	CY	\$4.97	\$325	022-254-0500	
Install curb and gutter	900	LF	\$8.90	\$8,010	025-025-0448	97 Site
Install catch basins	9	EA	\$1,535.00	\$13,815	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	990	LF	\$5.30	\$5,247	027-108-3020	97 Site p. 87
					\$27,397	
<i>Install sidewalks</i>						
Remove existing soil	600	SY	\$6.70	\$4,020	020-554-1750	
Grade soil	600	SY	\$0.72	\$432	0225-122-1020	97 Site p. 63
Install sidewalk	900	LF	\$13.20	\$11,880	A12.7-140-1580	97 Assemblies p. 421
					\$16,332	
<i>Install trees and sod next to sidewalk</i>						
Hauling of fill	78	CY	\$23.00	\$1,789	022-266-0560	97 Site p. 46
Spread fill material	78	CY	\$1.40	\$109	022-262-0010	97 Site p. 46
Install sod	6	MSF	\$505.00	\$3,030	029-316-0300	97 Site p. 116
Install trees and pit	15	EA	\$100.07	\$1,501	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
					\$6,429	
<i>Install traffic control directional signs</i>						
Install new signs	2	EA	\$77.50	\$155	028-412-0600 & 028-412-1600	97 Site
Excavate for new posts	1	CY	\$4.48	\$3	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$363	033-130-1520	97 Site
					\$521	
<i>Install reflective street signs</i>						
Install new signs	2	EA	\$97.00	\$194	104-304-4900	
Excavate for new posts	1	CY	\$4.48	\$3	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$363	033-130-1520	97 Site
					\$560	
<i>Install street lights</i>						
Install street lights 400 watt	2	EA	\$2,085.00	\$4,170	A12.7-500-2330	
					\$4,170	
SUBTOTAL				\$99,666		
City cost Index						
TOTAL	93.7%			\$93,387		
TOTAL with contingency of:						
TOTAL with contingency of:	10%			\$102,725		
ROUNDED TO	30%			\$121,403		
ROUNDED TO				\$103,000		
ROUNDED TO				\$121,000		

Table C.21. Link-18 - Upgrade roads along golf course to Sub-Trunk Collector (Harlow to Sand Creek Parkway).

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Existing road removal</i>						
<i>Demolition</i>						
Remove top soil	2,100	CY	\$0.93	\$1,953	029-204-1400	98 Site p. 116
Remove existing road	6,300	SY	\$6.10	\$38,430	020-554-1750	98 Site p. 28
Rubbish handling	3,500	CY	\$14.40	\$50,400	020-620-3080	98 Site p. 29
Haul debris to dump	3,500	CY	\$12.80	\$44,800	020-620-5000	98 Site p. 29
Disposal fee for debris	3,500	CY	\$6.00	\$21,000		
					\$156,583	
<i>Remove existing sidewalk and curb and gutter</i>						
Remove curb and gutter	4,200	LF	\$3.91	\$16,422	020-554-2500	98 Site p. 28
Remove sidewalk	0	SY	\$7.15	\$0	020-254-4200	98 Site p. 28
Rubbish handling	277	CY	\$14.40	\$3,992	020-620-3080	98 Site p. 29
Haul debris to dump	277	CY	\$12.80	\$3,548	020-620-5000	98 Site p. 29
Disposal fee for debris	277	CY	\$6.00	\$1,663		
					\$25,625	
<i>New road construction</i>						
<i>Install new road</i>						
Cut soil for new road	8,912	CY	\$1.64	\$14,616	022-242-2000	96 Site & Work
Grade soil	0	SY	\$0.72	\$0	025-122-1020	98 Site p. 69
Install and compact crushed stone base material	0	SY	\$19.15	\$0	022-308-0300	98 Site p. 53
Install 4" binder course	12,262	SY	\$6.95	\$85,222	025-104-0200	98 Site p. 67
Install 4" wearing course	12,262	SY	\$8.43	\$103,371	025-104-0340 + 025-104-0460	98 Site p. 68
Compaction of asphalt surface	2,725	CY	\$0.47	\$1,281	025-226-5020	
					\$204,490	
<i>Paint markings</i>						
Layout of crosswalk	2	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	500	LF	\$1.17	\$585	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	8,900	LF	\$0.04	\$356	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	8,900	LF	\$0.80	\$7,120	025-804-0710	98 Site p. 75
					\$8,061	
<i>Install new curb & gutter plus catch basin</i>						
Excavate for curb and gutter	258	CY	\$4.97	\$1,285	022-254-0500	97 Site
Install curb and gutter	3,560	LF	\$8.90	\$31,684	025-025-0448	97 Site
Install catch basins	36	EA	\$1,535.00	\$55,260	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	3,916	LF	\$5.30	\$20,755	027-108-3020	97 Site p. 87
					\$108,983	
<i>Install sidewalks</i>						
Remove existing soil	2,373	SY	\$6.70	\$15,901	020-554-1750	97 Site p. 28
Grade soil	2,373	SY	\$0.72	\$1,709	0225-122-1020	97 Site p. 63
Install sidewalk	3,560	LF	\$13.20	\$46,992	A12.7-140-1580	97 Assemblies p. 421
					\$64,602	
<i>Install trees and sod next to sidewalk</i>						
Hauling of fill	308	CY	\$23.00	\$7,076	022-266-0560	97 Site p. 46
Spread fill material	308	CY	\$1.40	\$431	022-262-0010	97 Site p. 46
Install sod	25	MSF	\$505.00	\$12,625	029-316-0300	97 Site p. 116
Install trees and pit	59	EA	\$100.07	\$5,904	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
					\$26,036	
<i>Install traffic control directional signs</i>						
Install new signs	4	EA	\$77.50	\$310	028-412-0600 & 028-412-1600	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
					\$1,042	
<i>Install reflective street signs</i>						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
					\$1,120	
<i>Install street lights</i>						
Install street lights 400 watt	9	EA	\$2,085.00	\$18,765	A12.7-500-2330	
					\$18,765	
SUBTOTAL					\$615,307	
City cost index					\$576,543	
TOTAL						
TOTAL with contingency of:			10%		\$634,197	
TOTAL with contingency of:			30%		\$749,506	
ROUNDED TO					\$634,000	
ROUNDED TO					\$750,000	

Table C.22. Link-20 - New connector between Peoria and S. Hutton at S. 1st Street.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Existing road removal</i>						
Demolition						
Remove top soil	440	CY	\$0.93	\$409	029-204-1400	
Remove existing road	1,320	SY	\$6.10	\$8,052	020-554-1750	98 Site p. 116
Rubbish handling	733	CY	\$14.40	\$10,560	020-620-3080	98 Site p. 28
Haul debris to dump	733	CY	\$12.80	\$9,387	020-620-5000	98 Site p. 29
Disposal fee for debris	733	CY	\$6.00	\$4,400		98 Site p. 29
					\$32,808	
<i>New road construction</i>						
<i>Install new road</i>						
Cut soil for new road	2,889	CY	\$1.64	\$4,739	022-242-2000	
Grade soil	0	SY	\$0.72	\$0	025-122-1020	96 Site&Work
Install and compact crushed stone base material	0	SY	\$19.15	\$0	022-308-0300	98 Site p. 69
Install 4" binder course	4,409	SY	\$6.95	\$30,642	025-104-0200	98 Site p. 53
Install 4" wearing course	4,409	SY	\$8.43	\$37,167	025-104-0340 + 025-104-0460	98 Site p. 67
Compaction of asphalt surface	980	CY	\$0.47	\$460	025-226-5020	98 Site p. 68
					\$73,008	
<i>Paint markings</i>						
Layout of crosswalk	2	LF	\$0.04	\$0	025-804-0790	
Paint crosswalk (Thermoplastic paint)	500	LF	\$1.17	\$585	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	3,200	LF	\$0.04	\$128	025-804-0790	97 Site
Install pavement marking (Thermoplastic paint)	3,200	LF	\$0.80	\$2,560	025-804-0710	98 Site p. 76
					\$3,273	98 Site p. 75
<i>Install new curb & gutter plus catch basin</i>						
Excavate for curb and gutter	93	CY	\$4.97	\$462	022-254-0500	
Install curb and gutter	1,280	LF	\$8.90	\$11,392	025-025-0448	97 Site
Install catch basins	13	EA	\$1,535.00	\$19,955	A12.3-710-5820	97 Site
Install pipe to connect basins	1,408	LF	\$5.30	\$7,462	027-108-3020	97 Site p. 365
					\$39,271	97 Site p. 87
<i>Install sidewalks</i>						
Remove existing soil	853	SY	\$6.70	\$5,717	020-554-1750	97 Site p. 28
Grade soil	853	SY	\$0.72	\$614	0225-122-1020	97 Site p. 63
Install sidewalk	1,280	LF	\$13.20	\$16,896	A12.7-140-1580	97 Assemblies p. 421
					\$23,228	
<i>Install trees and sod next to sidewalk</i>						
Hauling of fill	111	CY	\$23.00	\$2,544	022-266-0560	
Spread fill material	111	CY	\$1.40	\$155	022-262-0010	97 Site p. 46
Install sod	9	MSF	\$505.00	\$4,545	029-318-0300	97 Site p. 46
Install trees and pit	21	EA	\$100.07	\$2,101	A12.7-421-0000/R029-540	97 Site p. 116
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site
					\$9,346	97 Site p. 108
<i>Install traffic control directional signs</i>						
Install new signs	4	EA	\$77.50	\$310	028-412-0600 & 028-412-1600	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
					\$1,042	
<i>Install reflective street signs</i>						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
					\$1,120	97 Site
<i>Install street lights</i>						
Install street lights 400 watt	3	EA	\$2,085.00	\$6,255	A12.7-500-2330	
					\$6,255	
SUBTOTAL						
City cost index					\$189,350	
TOTAL					\$177,421	
TOTAL with contingency of:					\$195,163	
TOTAL with contingency of:					\$230,647	
ROUNDED TO					\$195,000	
ROUNDED TO					\$231,000	

Table C.23. Colfax Avenue - Overlay Colfax only.

Action	Quantity	UOM	Cost/Unit	Total Cost	Means Ref. No.	Book
<i>Add two lanes to existing 4 lanes</i>						
<i>Repair existing with an overlay</i>						
Sweep and remove debris	260	MSF	\$2.22	\$577	029-710-6420	98 Site p. 125
Repair potholes & damages (EST 15% of existing)	4,332	SY	\$13.05	\$56,533	029-710-5910	98 Site p. 125
Install 1-1/2" binder course	28,880	SY	\$2.82	\$81,442	025-104-0160	98 Site p. 67
Install 1-1/2" overlay	28,880	SY	\$3.30	\$95,304	025-104-0460	98 Site p. 68
Compaction of 3" asphalt surface	2,407	CY	\$0.20	\$481	022-226-5020	98 Site p. 44
Layout of pavement marking	0	LF	\$0.04	\$0	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic)	0	LF	\$0.80	\$0	025-804-0710	98 Site p. 75
<i>Paint markings</i>						
Layout of crosswalk	14	LF	\$0.04	\$1	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	1,092	LF	\$1.17	\$1,278	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	27,075	LF	\$0.04	\$1,083	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	27,075	LF	\$0.80	\$21,660	025-804-0710	98 Site p. 75
<i>Install sidewalks</i>						
Remove existing soil	4,813	SY	\$6.70	\$32,249	020-554-1750	97 Site p. 28
Grade soil	4,813	SY	\$0.72	\$3,466	0225-122-1020	97 Site p. 63
Install sidewalk	5,415	LF	\$13.20	\$71,478	A12.7-140-1580	97 Assemblies p. 421
<i>Install trees and sod next to sidewalk and median</i>						
Hauling of fill	2,540	CY	\$23.00	\$58,429	022-266-0560	97 Site p. 46
Spread fill material	2,540	CY	\$1.40	\$3,557	022-262-0010	97 Site p. 46
Install sod	206	MSF	\$505.00	\$104,030	029-316-0300	97 Site p. 116
Install trees and pit	181	EA	\$100.07	\$18,113	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
<i>Install traffic control directional signs</i>						
Install new signs	14	EA	\$77.50	\$1,085	028-412-0600 &028-412-1600	97 Site
Excavate for new posts	5	CY	\$4.48	\$22	022-254-0060	97 Site
Concrete for new posts	5	CY	\$520.00	\$2,540	033-130-1520	97 Site
<i>Install reflective street signs</i>						
Install new signs	14	EA	\$97.00	\$1,358	104-304-4900	97 Site
Excavate for new posts	5	CY	\$4.48	\$22	022-254-0060	97 Site
Concrete for new posts	5	CY	\$520.00	\$2,540	033-130-1520	97 Site
SUBTOTAL				\$557,245		
City cost index	93.7%					
TOTAL				\$522,139		
TOTAL with contingency of:	10%			\$574,352		
TOTAL with contingency of:	30%			\$678,780		
ROUNDED TO				<u>\$574,000</u>		
ROUNDED TO				<u>\$679,000</u>		

Table C.24. Peoria-1 - Open Harlow Avenue entrance in 1998 (CERL1).

Action	Quantity	UOM	Cost/Unit	Total Cost	Means Ref. No.	Book
<i>Repair existing with an overlay</i>						
Sweep and remove debris	9	MSF	\$2.13	\$19	029-710-6420	96 Site&Work
Cut soil from West Guard House)	7	CY	\$1.64	\$12	022-242-2000	96 Site&Work
Grade soil	13	SY	\$0.72	\$9	025-122-1020	98 Site p. 69
Install and compact crushed 12" stone base material	13	SY	\$19.15	\$243	022-308-0300	98 Site p. 53
Install 4" binder course	13	SY	\$6.95	\$88	025-104-0200	98 Site p. 67
Install 4" wearing course	13	SY	\$8.43	\$107	025-104-0340 + 025-104-0460	98 Site p. 68
Compaction of asphalt surface	3	CY	\$1.41	\$4	025-226-5020	
Repair potholes & damages (EST 15% of existing)	150	SY	\$8.45	\$1,268	029-710-5910	96 Site&Work
Install 1-1/2" binder course	1,000	SY	\$2.82	\$2,820	025-104-0160	97 Site&Work
Install 1-1/2" overlay	1,000	SY	\$3.27	\$3,270	025-104-0460	97 Site&Work
Compaction of 3" asphalt surface	56	CY	\$1.41	\$78	022-226-5020	97 Site&Work
Layout of pavement marking	750	LF	\$0.04	\$30	025-804-0790	96 Site&Work
Install pavement marking (Thermoplastic)	750	LF	\$0.47	\$353	025-804-0710	96 Site&Work
		Total			\$8,300	
<i>Install reflective street signs</i>						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
		Total			\$1,120	
<i>Install street lights</i>						
Install street lights 400 watt	1	EA	\$2,085.00	\$2,085	A12.7-500-2330	
		Total			\$2,085	
<i>Removals</i>						
West Gate Guard House (Bldg 25)	114	SF	\$9.35	\$1,066	CERL estimate	
Roller Gate Assy	1	EA	\$237.50	\$238	020-554-0700	
Rubbish Handling	79	CY	\$13.30	\$1,052	CERL estimate	
Rubbish Hauling	79	CY	\$6.30	\$498	CERL estimate	
Disposal Fees	79	CY	\$6.00	\$475	CERL estimate	
		Total			\$3,329	
SUBTOTAL				\$14,833		
City cost index		93.7%				
TOTAL				\$13,899		
TOTAL with contingency of:		10%		\$15,288		
TOTAL with contingency of:		30%		\$18,068		
ROUNDED TO				\$15,000		
ROUNDED TO				\$18,000		

Table C.25. Peoria-2 - Landscape Peoria Street between Harlow and Colfax (CERL1).

Action	Quantity	UOM	Cost/Unit	Total Cost	Means Ref. No.	Book
<i>Install trees and sod</i>						
Hauling of fill	185	CY	\$23.00	\$4,259	022-266-0560	97 Site p. 46
Spread fill material	185	CY	\$1.40	\$259	022-262-0010	97 Site p. 46
Install sod	15	MSF	\$505.00	\$7,575	029-316-0300	97 Site p. 116
Install trees and pit	42	EA	\$100.07	\$4,203	A12.7-421-0000/R029-540	97 Site
Irrigation system	15,000	SF	\$0.61	\$9,150	027-104-0900	97 Site p. 108
<i>Removal of chain link fencing</i>						
fabric removal	2,500	LF	\$2.52	\$6,300	020-554-0700	98 Fac p. 37
post removal	250	EA	\$12.15	\$3,038	020-554-0860	98 Fac p. 37
Rubish Handling	796	CY	\$13.30	\$10,591	CERL estimate	
Rubish Hauling	796	CY	\$6.30	\$5,017	CERL estimate	
Disposal Fees	796	CY	\$6.00	\$4,778	CERL estimate	
<i>Install new entrance</i>						
Hauling of fill	93	CY	\$23.00	\$2,130	022-266-0560	97 Site p. 46
Spread fill material	93	CY	\$1.40	\$130	022-262-0010	97 Site p. 46
Install sod	5	MSF	\$505.00	\$2,525	029-316-0300	97 Site p. 116
Install trees and pit	40	EA	\$100.07	\$4,003	A12.7-421-0000/R029-540	97 Site
Irrigation system	5,000	SF	\$0.61	\$3,050	027-104-0900	97 Site p. 108
Install shrubs	40	Each	\$69.85	\$2,794	S	
Install flowers	100	Each	\$10.00	\$1,000	S	
Install new signs	2	Each	\$2,250.00	\$4,500	104-104-0900	97 Site p. 219
<i>Install new street lights</i>						
Install new street lights	13	EA	\$2,835.00	\$36,855	A12.7-500-2340	98 Site p. 409
<i>Install traffic light foundations</i>						
Excavate foundation for traffic pole	0	CY	\$52.00	\$0	022-250-0300	98 Site p. 48
Install concrete foundation for traffic pole	0	CY	\$305.00	\$0	033-130-1500	98 Site p. 145
<i>Install lights</i>						
Install signals programmed	0	intersect	\$44,600.00	\$0	028-424-0100	98 Site p. 115
Install traffic turn signals	2	no. inter	\$2,825.00	\$0	028-424-0120	98 Site p. 115
Install fully actuated, detectors in all streets/intersection	0	intersect	\$7,975.00	\$0	028-424-0300	98 Site p. 115
Install pedestrian push button	0	EA	\$5,850.00	\$0	028-424-0400	98 Site p. 116
Install optical programming	0	EA	\$3,650.00	\$0	028-424-0500	98 Site p. 116
	Total			\$112,155		
SUBTOTAL	93.7%					
City cost index				\$105,089		
TOTAL						
TOTAL with contingency of:	10%			\$115,598		
TOTAL with contingency of:	30%			\$136,616		
ROUNDED TO				\$116,000		
ROUNDED TO				\$137,000		

Table C.26. Link-1 - Construct Sand Creek Parkway between 26th Ave and 23rd Street extension (CERL1).

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install new road						
Cut soil for new road	14,541	CY	\$1.64	\$23,847	022-242-2000	96 Site&Work
Grade soil	26,173	SY	\$0.72	\$18,845	025-122-1020	98 Site p. 69
Install and compact crushed stone base material	26,173	SY	\$19.15	\$501,219	022-308-0300	98 Site p. 53
Install 4" binder course	26,173	SY	\$6.95	\$181,905	025-104-0200	98 Site p. 67
Install 4" wearing course	26,173	SY	\$8.43	\$220,641	025-104-0340 + 025-104-0460	98 Site p. 68
Compaction of asphalt surface	5,816	CY	\$0.47	\$2,734	025-226-5020	
				\$949,190		
Paint markings						
Layout of crosswalk	2	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	500	LF	\$1.17	\$585	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	15,100	LF	\$0.04	\$604	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	15,100	LF	\$0.80	\$12,080	025-804-0710	98 Site p. 75
				\$13,269		
Install new curb & gutter plus catch basin						
Excavate for curb and gutter	877	CY	\$4.97	\$4,359	022-254-0500	97 Site
Install curb and gutter	12,080	LF	\$8.90	\$107,512	025-025-0448	97 Site
Install catch basins	60	EA	\$1,535.00	\$92,100	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	6,644	LF	\$5.30	\$35,213	027-108-3020	97 Site p. 87
				\$239,184		
Install sidewalks						
Remove existing soil	5,369	SY	\$6.70	\$35,972	020-554-1750	97 Site p. 28
Grade soil	5,369	SY	\$0.72	\$3,866	0225-122-1020	97 Site p. 63
Install sidewalk	6,040	LF	\$13.20	\$79,728	A12.7-140-1580	97 Assemblies p. 421
				\$119,565		
Install trees and sod next to sidewalk						
Hauling of fill	746	CY	\$23.00	\$17,151	022-266-0560	97 Site p. 46
Spread fill material	746	CY	\$1.40	\$1,044	022-262-0010	97 Site p. 46
Install sod	60	MSF	\$505.00	\$30,300	029-316-0300	97 Site p. 116
Install trees and pit	101	EA	\$100.07	\$10,107	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
				\$58,602		
Install traffic control directional signs						
Install new signs	4	EA	\$77.50	\$310	028-412-0600 & 028-412-1600	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
				\$1,042		
Install reflective street signs						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
				\$1,120		
Install street lights						
Install street lights 400 watt	15	EA	\$2,085.00	\$31,275	A12.7-500-2330	
				\$31,275		
SUBTOTAL						
City cost Index	93.7%					
TOTAL				\$1,413,247		
TOTAL with contingency of:						
TOTAL with contingency of:	10%			\$1,456,634		
	30%			\$1,721,476		
ROUNDED TO						
ROUNDED TO				\$1,457,000		
				\$1,721,000		

Table C-27. Link-2 - Construct Sand Creek Parkway between N. 10th and 23rd Street extension (CERL1).

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install new road						
Cut soil for new road	2,311	CY	\$1.64	\$3,790	022-242-2000	96 Site&Work
Grade soil	4,160	SY	\$0.72	\$2,995	025-122-1020	98 Site p. 69
Install and compact crushed stone base material	4,160	SY	\$19.15	\$79,664	022-308-0300	98 Site p. 53
Install 4" binder course	4,160	SY	\$6.95	\$28,912	025-104-0200	98 Site p. 67
Install 4" wearing course	4,160	SY	\$8.43	\$35,069	025-104-0340 + 025-104-0460	98 Site p. 68
Compaction of asphalt surface	924	CY	\$0.47	\$434	025-226-5020	
	Total			\$150,865		
Paint markings						
Layout of crosswalk	2	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	500	LF	\$1.17	\$585	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	2,400	LF	\$0.04	\$96	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	2,400	LF	\$0.80	\$1,920	025-804-0710	98 Site p. 75
	Total			\$2,601		
Install new curb & gutter plus catch basin						
Excavate for curb and gutter	139	CY	\$4.97	\$693	022-254-0500	97 Site
Install curb and gutter	1,920	LF	\$8.90	\$17,088	025-025-0448	97 Site
Install catch basins	10	EA	\$1,535.00	\$15,350	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	1,056	LF	\$5.30	\$5,597	027-108-3020	97 Site p. 87
	Total			\$38,728		
Install sidewalks						
Remove existing soil	853	SY	\$6.70	\$5,717	020-554-1750	97 Site p. 28
Grade soil	853	SY	\$0.72	\$614	0225-122-1020	97 Site p. 63
Install sidewalk	960	LF	\$13.20	\$12,672	A12.7-140-1580	97 Assemblies p. 421
	Total			\$19,004		
Install trees and sod next to sidewalk						
Hauling of fill	119	CY	\$23.00	\$2,726	022-266-0560	97 Site p. 46
Spread fill material	119	CY	\$1.40	\$166	022-262-0010	97 Site p. 46
Install sod	10	MSF	\$505.00	\$5,050	029-316-0300	97 Site p. 116
Install trees and pit	16	EA	\$100.07	\$1,601	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
	Total			\$9,543		
Install traffic control directional signs						
Install new signs	4	EA	\$77.50	\$310	028-412-0600 & 028-412-1600	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
	Total			\$1,042		
Install reflective street signs						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
	Total			\$1,120		
Install street lights						
Install street lights 400 watt	2	EA	\$2,085.00	\$4,170	A12.7-500-2330	
	Total			\$4,170		
SUBTOTAL				\$227,072		
City cost index	93.7%					
TOTAL				\$212,766		
TOTAL with contingency of:	10%			\$234,043		
TOTAL with contingency of:	30%			\$276,596		
ROUNDED TO				\$234,000		
ROUNDED TO				\$277,000		

Table C.28. Link-3 - Construct Sand Creek Parkway between N. Cooper and 23rd Street extension (CERL1).

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install new road						
Cut soil for new road	8,354	CY	\$1.64	\$13,700	022-242-2000	96 Site&Work
Grade soil	15,037	SY	\$0.72	\$10,826	025-122-1020	98 Site p. 69
Install and compact crushed stone base material	15,037	SY	\$19.15	\$287,952	022-308-0300	98 Site p. 53
Install 4" binder course	15,037	SY	\$6.95	\$104,505	025-104-0200	98 Site p. 67
Install 4" wearing course	15,037	SY	\$8.43	\$126,759	025-104-0340 + 025-104-0460	98 Site p. 68
Compaction of asphalt surface	3,341	CY	\$0.47	\$1,570	025-226-5020	
						\$545,313
Paint markings						
Layout of crosswalk	2	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	500	LF	\$1.17	\$585	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	8,675	LF	\$0.04	\$347	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	8,675	LF	\$0.80	\$6,940	025-804-0710	98 Site p. 75
						\$7,872
Install new curb & gutter plus catch basin						
Excavate for curb and gutter	504	CY	\$4.97	\$2,504	022-254-0500	97 Site
Install curb and gutter	6,940	LF	\$8.90	\$61,766	025-025-0448	97 Site
Install catch basins	35	EA	\$1,535.00	\$53,725	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	3,817	LF	\$5.30	\$20,230	027-108-3020	97 Site p. 87
						\$138,225
Install sidewalks						
Remove existing soil	1,542	SY	\$6.70	\$10,333	020-554-1750	97 Site p. 28
Grade soil	1,542	SY	\$0.72	\$1,110	0225-122-1020	97 Site p. 63
Install sidewalk	1,735	LF	\$13.20	\$22,902	A12.7-140-1580	97 Assemblies p. 421
						\$34,345
Install trees and sod next to sidewalk						
Hauling of fill	214	CY	\$23.00	\$4,927	022-266-0560	97 Site p. 46
Spread fill material	214	CY	\$1.40	\$300	022-262-0010	97 Site p. 46
Install sod	17	MSF	\$505.00	\$8,585	029-316-0300	97 Site p. 116
Install trees and pit	29	EA	\$100.07	\$2,902	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
						\$16,713
Install traffic control directional signs						
Install new signs	4	EA	\$77.50	\$310	028-412-0600 & 028-412-160	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
						\$1,042
Install reflective street signs						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
						\$1,120
Install street lights						
Install street lights 400 watt	9	EA	\$2,085.00	\$18,765	A12.7-500-2330	
						\$18,765
SUBTOTAL						
City cost index	93.7%					\$763,396
TOTAL						\$715,302
TOTAL with contingency of:						\$786,832
TOTAL with contingency of:						\$929,893
ROUNDED TO						\$787,000
ROUNDED TO						\$930,000

Table C.29. Link-4 - Construct Sand Creek Parkway between Harlow and Cooper (CERL1).

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install new road</i>						
Cut soil for new road	5,393	CY	\$1.64	\$8,844	022-242-2000	96 Site&Work
Grade soil	9,707	SY	\$0.72	\$6,989	025-122-1020	98 Site p. 69
Install and compact crushed stone base material	9,707	SY	\$19.15	\$185,883	022-308-0300	98 Site p. 53
Install 4" binder course	9,707	SY	\$6.95	\$67,461	025-104-0200	98 Site p. 67
Install 4" wearing course	9,707	SY	\$8.43	\$81,827	025-104-0340 + 025-104-0460	98 Site p. 68
Compaction of asphalt surface	2,157	CY	\$0.47	\$1,014	025-226-5020	
	Total			\$352,018		
<i>Paint markings</i>						
Layout of crosswalk	2	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	500	LF	\$1.17	\$585	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	5,600	LF	\$0.04	\$224	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	5,600	LF	\$0.80	\$4,480	025-804-0710	98 Site p. 75
	Total			\$5,289		
<i>Install new curb & gutter plus catch basin</i>						
Excavate for curb and gutter	325	CY	\$4.97	\$1,616	022-254-0500	97 Site
Install curb and gutter	4,480	LF	\$8.90	\$39,872	025-025-0448	97 Site
Install catch basins	22	EA	\$1,535.00	\$33,770	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	2,464	LF	\$5.30	\$13,059	027-108-3020	97 Site p. 87
	Total			\$88,318		
<i>Install sidewalks</i>						
Remove existing soil	1,991	SY	\$6.70	\$13,340	020-554-1750	97 Site p. 28
Grade soil	1,991	SY	\$0.72	\$1,434	0225-122-1020	97 Site p. 63
Install sidewalk	2,240	LF	\$13.20	\$29,568	A12.7-140-1580	97 Assemblies p. 421
	Total			\$44,342		
<i>Install trees and sod next to sidewalk</i>						
Hauling of fill	277	CY	\$23.00	\$6,360	022-266-0560	97 Site p. 46
Spread fill material	277	CY	\$1.40	\$387	022-262-0010	97 Site p. 46
Install sod	22	MSF	\$505.00	\$11,110	029-316-0300	97 Site p. 116
Install trees and pit	37	EA	\$100.07	\$3,703	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
	Total			\$21,560		
<i>Install traffic control directional signs</i>						
Install new signs	4	EA	\$77.50	\$310	028-412-0600 &028-412-1600	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
	Total			\$1,042		
<i>Install reflective street signs</i>						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
	Total			\$1,120		
<i>Install street lights</i>						
Install street lights 400 watt	6	EA	\$2,085.00	\$12,510	A12.7-500-2330	
	Total			\$12,510		
SUBTOTAL				\$526,199		
City cost index				\$493,048		
TOTAL						
TOTAL with contingency of:			10%	\$542,353		
TOTAL with contingency of:			30%	\$640,963		
ROUNDED TO				\$542,000		
ROUNDED TO				\$641,000		

Table C.30. Link-5 - Construct Sand Creek Parkway between W. Harlow and Charlie Kelly (CERL1).

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install new road						
Cut soil for new road	6,789	CY	\$1.64	\$11,134	022-242-2000	96 Site&Work
Grade soil	12,220	SY	\$0.72	\$8,798	025-122-1020	98 Site p. 69
Install and compact crushed stone base material	12,220	SY	\$19.15	\$234,013	022-308-0300	98 Site p. 53
Install 4" binder course	12,220	SY	\$6.95	\$84,929	025-104-0200	98 Site p. 67
Install 4" wearing course	12,220	SY	\$8.43	\$103,015	025-104-0340 + 025-104-0460	98 Site p. 68
Compaction of asphalt surface	2,716	CY	\$0.47	\$1,276	025-226-5020	
						\$443,165
Paint markings						
Layout of crosswalk	0	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	0	LF	\$1.17	\$0	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	5,640	LF	\$0.04	\$226	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	5,640	LF	\$0.80	\$4,512	025-804-0710	98 Site p. 75
						\$4,738
Install new curb & gutter plus catch basin						
Excavate for curb and gutter	409	CY	\$4.97	\$2,035	022-254-0500	97 Site
Install curb and gutter	5,640	LF	\$8.90	\$50,196	025-025-0448	97 Site
Install catch basins	28	EA	\$1,535.00	\$42,980	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	3,102	LF	\$5.30	\$16,441	027-108-3020	97 Site p. 87
						\$111,652
Install sidewalks						
Remove existing soil	2,507	SY	\$6.70	\$16,795	020-554-1750	97 Site p. 28
Grade soil	2,507	SY	\$0.72	\$1,805	0225-122-1020	97 Site p. 63
Install sidewalk	2,820	LF	\$13.20	\$37,224	A12.7-140-1580	97 Assemblies p. 421
						\$55,823
Install trees and sod next to sidewalk						
Hauling of fill	348	CY	\$23.00	\$8,007	022-266-0560	97 Site p. 46
Spread fill material	348	CY	\$1.40	\$487	022-262-0010	97 Site p. 46
Install sod	28	MSF	\$505.00	\$14,140	029-316-0300	97 Site p. 116
Install trees and pit	47	EA	\$100.07	\$4,703	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
						\$27,338
Install traffic control directional signs						
Install new signs	4	EA	\$77.50	\$310	028-412-0600 & 028-412-1600	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
						\$1,042
Install reflective street signs						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
						\$1,120
Install street lights						
Install street lights 400 watt	7	EA	\$2,085.00	\$14,595	A12.7-500-2330	
						\$14,595
SUBTOTAL						
City cost index						\$659,473
TOTAL						\$617,926
TOTAL with contingency of:						\$679,719
TOTAL with contingency of:						\$803,304
ROUNDED TO						\$680,000
ROUNDED TO						\$803,000

Table C.31. Link-6 - Upgrade Potomac to Sand Creek Parkway from Charlie Kelly to Colfax (CERL1).

Action	Quantity	UOM	Cost/Unit	Total Cost	Means Ref. No.	Book
Upgrade to Parkway						
Seal existing street						
Sweep and remove debris	52	MSF	\$2.15	\$113	029-710-6420	97 Site p. 119
Repair potholes & damages (5% of existing)	291	SY	\$12.90	\$3,754	029-710-5913	97 Site p. 119
Repair cracks with flooding (5% of existing)	291	SY	\$4.61	\$1,342	025-458-3320	97 Site p. 68
Slurry Seal road	5,820	SY	\$1.54	\$8,963	025-458-2350	97 Site p. 68
				\$14,171		
Add 1 new lane, median plus 2 bikeways						
Remove 12" soil	3,772	CY	\$1.64	\$6,186	022-242-2000	96 Site&Work
Grade remaining soil	6,790	SY	\$0.58	\$3,938	025-122-0100	96 Site&Work
Install & compact 12" crushed stone base	6,790	SY	\$10.20	\$69,258	022-308-0200	97 Site p. 48
Install 4" binder course	6,790	SY	\$6.95	\$47,191	025-104-0200	98 Site p. 67
Install 4" wearing course	6,790	SY	\$8.43	\$57,240	025-104-0340 + 025-104-0460	98 Site p. 68
Compaction of 8" asphalt surface	1,509	CY	\$0.47	\$709	022-226-5020	96 Site&Work
				\$184,522		
Paint markings						
Layout of crosswalk	8	LF	\$0.04	\$0	025-804-0790	97 Site
Paint crosswalk (Thermoplastic paint)	2,000	LF	\$1.17	\$2,340	025-804-0730	97 Site
Layout of directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Paint directional arrows	0	SF	\$4.61	\$0	025-804-0760	97 Site
Layout of pavement marking	7,275	LF	\$0.04	\$291	025-804-0790	98 Site p. 76
Install pavement marking (Thermoplastic paint)	7,275	LF	\$0.80	\$5,820	025-804-0710	98 Site p. 75
				\$8,451		
Install new curb & gutter plus catch basin						
Excavate for curb and gutter	317	CY	\$4.97	\$1,575	022-254-0500	97 Site
Install curb and gutter	4,365	LF	\$8.90	\$38,849	025-025-0448	97 Site
Install catch basins	15	EA	\$1,535.00	\$23,025	A12.3-710-5820	97 Site p. 365
Install pipe to connect basins	1,601	LF	\$5.30	\$8,483	027-108-3020	97 Site p. 87
				\$71,931		
Install sidewalks						
Remove existing soil	1,293	SY	\$6.70	\$8,665	020-554-1750	97 Site p. 28
Grade soil	1,293	SY	\$0.72	\$931	0225-122-1020	97 Site p. 63
Install sidewalk	1,455	LF	\$13.20	\$19,206	A12.7-140-1580	97 Assemblies p. 421
				\$28,803		
Install trees and sod next to sidewalk						
Hauling of fill	180	CY	\$23.00	\$4,131	022-266-0560	97 Site p. 46
Spread fill material	180	CY	\$1.40	\$251	022-262-0010	97 Site p. 46
Install sod	15	MSF	\$505.00	\$7,575	029-316-0300	97 Site p. 116
Install trees and pit	24	EA	\$100.07	\$2,402	A12.7-421-0000/R029-540	97 Site
Irrigation system	0	SF	\$0.61	\$0	027-104-0900	97 Site p. 108
				\$14,360		
Install traffic control directional signs						
Install new signs	6	EA	\$77.50	\$465	028-412-0600 & 028-412-1600	97 Site
Excavate for new posts	2	CY	\$4.48	\$9	022-254-0060	97 Site
Concrete for new posts	2	CY	\$520.00	\$1,089	033-130-1520	97 Site
				\$1,563		
Install reflective street signs						
Install new signs	4	EA	\$97.00	\$388	104-304-4900	97 Site
Excavate for new posts	1	CY	\$4.48	\$6	022-254-0060	97 Site
Concrete for new posts	1	CY	\$520.00	\$726	033-130-1520	97 Site
				\$1,120		
Install street lights						
Install street lights 400 watt	7	EA	\$2,085.00	\$14,595	A12.7-500-2330	
				\$14,595		
SUBTOTAL				\$339,515		
City cost index	93.7%					
TOTAL				\$318,126		
TOTAL with contingency of:		10%		\$349,938		
TOTAL with contingency of:		30%		\$413,564		
ROUNDED TO				\$350,000		
ROUNDED TO				\$414,000		

Table C.32. DW-1 - Install new domestic water lines along Sand Creek Parkway.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	3,355	LF	\$13.80	\$46,299	A12.3-110-1440	98 Site p. 372
Install 12" pipe bedding	3,355	LF	\$2.03	\$6,811	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	0	LF	\$3.43	\$0	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	3,355	LF	\$28.50	\$95,618	026-660-1020	98 Site p. 82
install 12" shut off valves	6	EA	\$1,375.00	\$8,250	026-404-3340	98 Site p. 78
Install 16" diameter black steel pipe	0	LF	\$35.00	\$0	estimated	
install 16" shut off valves	0	EA	\$2,800.00	\$0	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
						\$156,977
<i>Install Pressure Reduction Valve</i>						
Install valve and backup	2	EA	\$10,000.00	\$20,000	CERL estimate	
						\$20,000
<i>Install fire hydrants</i>						
Install new hydrants	11	EA	\$3,810.00	\$41,910	A12.3-922-1300	98 Site p. 382
R & R existing hydrants		EA	\$1,050.00		020-550-0950	98 Site p. 27
						\$41,910
SUBTOTAL						\$218,887
City cost index	93.70%					
TOTAL						\$205,097
TOTAL with contingency of:	10%		\$20,510	\$225,607		
TOTAL with contingency of:	30%		\$61,529	\$266,626		
<u>ROUNDED TO</u>						<u>\$226,000</u>
<u>ROUNDED TO</u>						<u>\$267,000</u>

Table C-33 DW-2 - Install new domestic water lines along Sand Creek Parkway.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install pipe						
Excavate/backfill trench	561	LF	\$13.80	\$7,742	A12.3-110-1440	98 Site p. 372
Install 12" pipe bedding	561	LF	\$2.03	\$1,139	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	0	LF	\$3.43	\$0	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	561	LF	\$28.50	\$15,989	026-660-1020	98 Site p. 82
install 12" shut off valves	1	EA	\$1,375.00	\$1,375	026-404-3340	98 Site p. 78
Install 16" diameter black steel pipe	0	LF	\$35.00	\$0	estimated	
install 16" shut off valves	0	EA	\$2,800.00	\$0	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
	Total				\$26,244	
Install fire hydrants						
Install new hydrants	2	EA	\$3,810.00	\$7,620	A12.3-922-1300	98 Site p. 382
R & R existing hydrants		EA	\$1,050.00		020-550-0950	98 Site p. 27
	Total				\$7,620	
SUBTOTAL					\$33,864	
City cost index	93.70%					
TOTAL					\$31,731	
TOTAL with contingency of:	10%		\$3,173	\$34,904		
TOTAL with contingency of:	30%		\$9,519	\$41,250		
ROUNDED TO					\$35,000	
ROUNDED TO					\$41,000	

Table C.34. DW-3 - Install new domestic water lines along Sand Creek Parkway.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	1,340	LF	\$13.80	\$18,489	A12.3-110-1440	98 Site p. 372
Install 12" pipe bedding	1,340	LF	\$2.03	\$2,720	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	0	LF	\$3.43	\$0	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	1,340	LF	\$28.50	\$38,184	026-660-1020	98 Site p. 82
install 12" shut off valves	2	EA	\$1,375.00	\$2,750	026-404-3340	98 Site p. 78
Install 16" diameter black steel pipe	0	LF	\$35.00	\$0	estimated	
install 16" shut off valves	0	EA	\$2,800.00	\$0	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
		Total				\$62,143
<i>Install fire hydrants</i>						
Install new hydrants	4	EA	\$3,810.00	\$15,240	A12.3-922-1300	98 Site p. 382
R & R existing hydrants		EA	\$1,050.00		020-550-0950	98 Site p. 27
		Total				\$15,240
SUBTOTAL						
City cost index						\$77,383
TOTAL						\$72,508
TOTAL with contingency of:						
TOTAL with contingency of:						
<u>ROUNDED TO</u>						<u>\$80,000</u>
<u>ROUNDED TO</u>						<u>\$94,000</u>

Table C.35. DW-4 - Install new domestic water lines along Sand Creek Parkway.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	1,263	LF	\$13.80	\$17,427	A12.3-110-1440	98 Site p. 372
Install 12" pipe bedding	1,263	LF	\$2.03	\$2,563	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	0	LF	\$3.43	\$0	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	1,263	LF	\$28.50	\$35,990	026-660-1020	98 Site p. 82
install 12" shut off valves	2	EA	\$1,375.00	\$2,750	026-404-3340	98 Site p. 78
Install 16" diameter black steel pipe	0	LF	\$35.00	\$0	estimated	
install 16" shut off valves	0	EA	\$2,800.00	\$0	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
		Total			\$58,730	
<i>Install fire hydrants</i>						
Install new hydrants	4	EA	\$3,810.00	\$15,240	A12.3-922-1300	98 Site p. 382
R & R existing hydrants		EA	\$1,050.00		020-550-0950	98 Site p. 27
		Total			\$15,240	
SUBTOTAL					\$73,970	
City cost index						
TOTAL					\$69,310	
TOTAL with contingency of:		10%		\$6,931	\$76,241	
TOTAL with contingency of:		30%		\$20,793	\$90,103	
<u>ROUNDED TO</u>					<u>\$76,000</u>	
<u>ROUNDED TO</u>					<u>\$90,000</u>	

Table C.36. DW-6 - Install new domestic water lines along Potomac Street.

Table C.37. DW-8 - R & R domestic water lines along North 10th Avenue.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	1,263	LF	\$13.80	\$17,427	A12.3-110-1440	98 Site p. 372
Install 12" pipe bedding	1,263	LF	\$2.03	\$2,563	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	0	LF	\$3.43	\$0	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	1,263	LF	\$28.50	\$35,990	026-660-1020	98 Site p. 82
install 12" shut off valves	2	EA	\$1,375.00	\$2,750	026-404-3340	98 Site p. 78
Install 16" diameter black steel pipe	0	LF	\$35.00	\$0	estimated	
install 16" shut off valves	0	EA	\$2,800.00	\$0	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
						\$58,730
<i>Remove existing pipe</i>						
Saw cut pavement	2,534	LF	\$3.89	\$9,856	020-728-0020	98 Fac p.48
Remove 12' pipe	1148	LF	\$6.15	\$7,060	020-554-2900	98 Site p. 28
Remove 16" pipe	0	LF	\$7.35	\$0	CERL estimate	98 Site p. 28
Remove 18" pipe	0	LF	\$7.75	\$0	CERL estimate	98 Site p. 28
Rubbish handling	198	CY	\$14.40	\$2,847	020-620-3080	98 Site p. 29
Haul debris to dump	198	CY	\$12.80	\$2,531	020-620-5000	98 Site p. 29
Disposal fee for debris	198	CY	\$6.00	\$1,186	CERL estimate	
						\$23,480
<i>Install fire hydrants</i>						
Install new hydrants		EA	\$3,810.00	\$0	A12.3-922-1300	98 Site p. 382
R & R existing hydrants	4	EA	\$1,050.00	\$4,200	020-550-0950	98 Site p. 27
						\$4,200
<i>Repair roadway</i>						
Install and compact 6" crushed stone base ma	561	SY	\$9.75	\$5,472	022-308-0100	98 Site p. 53
Install 3" binder course	561	SY	\$5.30	\$2,975	025-104-0160	98 Site p.67
Install 3" wearing course	561	SY	\$6.20	\$3,480	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	561	CY	\$0.47	\$264	022-226-5020	96 Site&Work
						\$12,190
SUBTOTAL				\$98,600		
City cost index						
TOTAL				\$92,388		
TOTAL with contingency of:				\$101,627		
TOTAL with contingency of:				\$120,105		
<u>ROUNDED TO</u>				<u>\$102,000</u>		
<u>ROUNDED TO</u>				<u>\$120,000</u>		

Table C.38. DW-8 - R & R domestic water lines along North 10th Avenue.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	905	LF	\$13.80	\$12,493	A12.3-110-1440	98 Site p. 372
Install 12" pipe bedding	905	LF	\$2.03	\$1,838	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	0	LF	\$3.43	\$0	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	905	LF	\$28.50	\$25,801	026-660-1020	98 Site p. 82
install 12" shut off valves	2	EA	\$1,375.00	\$2,750	026-404-3340	98 Site p. 78
Install 16" diameter black steel pipe	0	LF	\$35.00	\$0	estimated	
install 16" shut off valves	0	EA	\$2,800.00	\$0	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
		Total				\$42,882
<i>Remove existing pipe</i>						
Saw cut pavement	1,819	LF	\$3.89	\$7,074	020-728-0020	98 Fac p.48
Remove 12' pipe	823	LF	\$6.15	\$5,061	020-554-2900	98 Site p. 28
Remove 16" pipe	0	LF	\$7.35	\$0	CERL estimate	98 Site p. 28
Remove 18" pipe	0	LF	\$7.75	\$0	CERL estimate	98 Site p. 28
Rubbish handling	165	CY	\$14.40	\$2,370	020-620-3080	98 Site p. 29
Haul debris to dump	165	CY	\$12.80	\$2,107	020-620-5000	98 Site p. 29
Disposal fee for debris	165	CY	\$6.00	\$988	CERL estimate	
		Total				\$17,601
<i>Install fire hydrants</i>						
Install new hydrants		EA	\$3,810.00	\$0	A12.3-922-1300	98 Site p. 382
R & R existing hydrants	3	EA	\$1,050.00	\$3,150	020-550-0950	98 Site p. 27
		Total				\$3,150
<i>Repair roadway</i>						
Install and compact 6" crushed stone base m	402	SY	\$9.75	\$3,923	022-308-0100	98 Site p. 53
Install 3" binder course	402	SY	\$5.30	\$2,132	025-104-0160	98 Site p.67
Install 3" wearing course	402	SY	\$6.20	\$2,495	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	402	CY	\$0.47	\$189	022-226-5020	96 Site&Work
		Total				\$8,739
SUBTOTAL				\$72,372		
City cost index	93.70%					
TOTAL				\$67,812		
TOTAL with contingency of:	10%		\$6,781	\$74,593		
TOTAL with contingency of:	30%		\$20,344	\$88,156		
<u>ROUNDED TO</u>				<u>\$75,000</u>		
<u>ROUNDED TO</u>				<u>\$88,000</u>		

Table C.39. DW-9 - R & R domestic water lines W. Loosely Ave to Sand Creek Parkway.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	447	LF	\$13.80	\$6,163	A12.3-110-1440	98 Site p. 372
Install 12" pipe bedding	447	LF	\$2.03	\$907	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	0	LF	\$3.43	\$0	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	447	LF	\$28.50	\$12,728	026-660-1020	98 Site p. 82
install 12" shut off valves	1	EA	\$1,375.00	\$1,375	026-404-3340	98 Site p. 78
Install 16" diameter black steel pipe	0	LF	\$35.00	\$0	estimated	
install 16" shut off valves	0	EA	\$2,800.00	\$0	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
						\$21,173
<i>Remove existing pipe</i>						
Saw cut pavement	0	LF	\$3.89	\$0	020-728-0020	98 Fac p.48
Remove 12' pipe	406	LF	\$6.15	\$2,497	020-554-2900	98 Site p. 28
Remove 16" pipe	0	LF	\$7.35	\$0	CERL estimate	98 Site p. 28
Remove 18" pipe	0	LF	\$7.75	\$0	CERL estimate	98 Site p. 28
Rubbish handling	15	CY	\$14.40	\$217	020-620-3080	98 Site p. 29
Haul debris to dump	15	CY	\$12.80	\$192	020-620-5000	98 Site p. 29
Disposal fee for debris	15	CY	\$6.00	\$90	CERL estimate	
						\$2,996
<i>Install fire hydrants</i>						
Install new hydrants		EA	\$3,810.00	\$0	A12.3-922-1300	98 Site p. 382
R & R existing hydrants	1	EA	\$1,050.00	\$1,050	020-550-0950	98 Site p. 27
						\$1,050
SUBTOTAL				\$25,219		
City cost index	93.70%					
TOTAL				\$23,630		
TOTAL with contingency of:	10%		\$2,363	\$25,993		
TOTAL with contingency of:	30%		\$7,089	\$30,719		
ROUNDED TO				\$26,000		
ROUNDED TO				\$31,000		

Table C.40. DW-10 - Install new domestic water lines through Golf Course to W. Loosely Ave Parkway.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install pipe						
Excavate/backfill trench	2,180	LF	\$13.80	\$30,087	A12.3-110-1440	98 Site p. 372
Install 12" pipe bedding	2,180	LF	\$2.03	\$4,426	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	0	LF	\$3.43	\$0	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	2,180	LF	\$28.50	\$62,136	026-660-1020	98 Site p. 375
install 12" shut off valves	4	EA	\$1,375.00	\$5,500	026-404-3340	98 Site p. 82
Install 16" diameter black steel pipe	0	LF	\$35.00	\$0	estimated	98 Site p. 78
install 16" shut off valves	0	EA	\$2,800.00	\$0	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
		Total			\$102,148	
Install Pressure Reduction Valve						
Install valve and backup	2	EA	\$10,000.00	\$20,000	CERL estimate	
		Total			\$20,000	
Install fire hydrants						
Install new hydrants	7	EA	\$3,810.00	\$26,670	A12.3-922-1300	98 Site p. 382
R & R existing hydrants		EA	\$1,050.00		020-550-0950	98 Site p. 27
		Total			\$26,670	
SUBTOTAL						
City cost index					\$148,818	
TOTAL		93.70%			\$139,443	
TOTAL with contingency of:		10%			\$153,387	
TOTAL with contingency of:		30%			\$41,833	
					\$181,276	
ROUNDED TO					<u>\$153,000</u>	
ROUNDED TO					<u>\$181,000</u>	

Table C-11 DW-11 P & P 6-in lines and add new to connect Charlie Kelly with Potomac line.

Table C.42. DW-12 - Extend existing east of McCloskey to Sand Creek Parkway water line.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	275	LF	\$13.80	\$3,795	A12.3-110-1440	98 Site p. 372
Install 12" pipe bedding	275	LF	\$2.03	\$558	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	0	LF	\$3.43	\$0	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	275	LF	\$28.50	\$7,838	026-660-1020	98 Site p. 82
install 12" shut off valves	1	EA	\$1,375.00	\$1,375	026-404-3340	98 Site p. 78
Install 16" diameter black steel pipe	0	LF	\$35.00	\$0	estimated	
install 16" shut off valves	0	EA	\$2,800.00	\$0	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
		Total				\$13,566
<i>Install fire hydrants</i>						
Install new hydrants	1	EA	\$3,810.00	\$3,810	A12.3-922-1300	98 Site p. 382
R & R existing hydrants	0	EA	\$1,050.00	\$0	020-550-0950	98 Site p. 27
		Total				\$3,810
<i>Repair roadway</i>						
Install and compact 6" crushed stone base m	0	SY	\$9.75	\$0	022-308-0100	98 Site p. 53
Install 3" binder course	0	SY	\$5.30	\$0	025-104-0160	98 Site p.67
Install 3" wearing course	0	SY	\$6.20	\$0	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	0	CY	\$0.47	\$0	022-226-5020	96 Site&Work
		Total				\$0
SUBTOTAL				\$17,376		
City cost index						
TOTAL				\$16,281		
TOTAL with contingency of:						
TOTAL with contingency of:						
ROUNDED TO				\$18,000		
ROUNDED TO				\$21,000		

Table C.43. DW-12 - Extend existing W. Harlow 12-in. line to Sand Creek Parkway.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	395	LF	\$13.80	\$5,450	A12.3-110-1440	98 Site p. 372
Install 12" pipe bedding	395	LF	\$2.03	\$802	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	0	LF	\$3.43	\$0	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	395	LF	\$28.50	\$11,255	026-660-1020	98 Site p. 82
install 12" shut off valves	1	EA	\$1,375.00	\$1,375	026-404-3340	98 Site p. 78
Install 16" diameter black steel pipe	0	LF	\$35.00	\$0	estimated	
install 16" shut off valves	0	EA	\$2,800.00	\$0	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
		Total				\$18,881
<i>Install fire hydrants</i>						
Install new hydrants	1	EA	\$3,810.00	\$3,810	A12.3-922-1300	98 Site p. 382
R & R existing hydrants	0	EA	\$1,050.00	\$0	020-550-0950	98 Site p. 27
		Total				\$3,810
SUBTOTAL				\$22,691		
City cost index				\$21,261		
TOTAL						
TOTAL with contingency of:		10%		\$2,126	\$23,388	
TOTAL with contingency of:		30%		\$6,378	\$27,640	
<u>ROUNDED TO</u>					<u>\$23,000</u>	
<u>ROUNDED TO</u>					<u>\$28,000</u>	

Table C.44. DW-13 - R & R old existing 6-in. lines with 12 in.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	600	LF	\$13.80	\$8,273	A12.3-110-1440	98 Site p. 372
Install 12" pipe bedding	600	LF	\$2.03	\$1,217	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	0	LF	\$3.43	\$0	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	600	LF	\$28.50	\$17,086	026-660-1020	98 Site p. 375
install 12" shut off valves	1	EA	\$1,375.00	\$1,375	026-404-3340	98 Site p. 82
Install 16" diameter black steel pipe	0	LF	\$35.00	\$0	estimated	98 Site p. 78
install 16" shut off valves	0	EA	\$2,800.00	\$0	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
						\$27,951
<i>Remove exisiting pipe</i>						
Saw cut pavement	1,207	LF	\$3.89	\$4,695	020-728-0020	98 Fac p.48
Remove 12' pipe	545	LF	\$6.15	\$3,352	020-554-2900	98 Site p. 28
Remove 16" pipe	0	LF	\$7.35	\$0	CERL estimate	98 Site p. 28
Remove 18" pipe	0	LF	\$7.75	\$0	CERL estimate	98 Site p. 28
Rubbish handling	109	CY	\$14.40	\$1,570	020-620-3080	98 Site p. 28
Haul debris to dump	109	CY	\$12.80	\$1,395	020-620-5000	98 Site p. 29
Disposal fee for debris	109	CY	\$6.00	\$654	CERL estimate	98 Site p. 29
						\$11,666
<i>Install fire hydrants</i>						
Install new hydrants		EA	\$3,810.00	\$0	A12.3-922-1300	98 Site p. 382
R & R existing hydrants	2	EA	\$1,050.00	\$2,100	020-550-0950	98 Site p. 27
						\$2,100
<i>Repair roadway</i>						
Install and compact 6" crushed stone base m	266	SY	\$9.75	\$2,598	022-308-0100	98 Site p. 53
Install 3" binder course	266	SY	\$5.30	\$1,412	025-104-0160	98 Site p.67
Install 3" wearing course	266	SY	\$6.20	\$1,652	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	266	CY	\$0.47	\$125	022-226-5020	96 Site&Work
						\$5,787
SUBTOTAL				\$47,504		
City cost index						
TOTAL				\$44,511		
TOTAL with contingency of:						
TOTAL with contingency of:						
<u>ROUNDED TO</u>				<u>\$49,000</u>		
<u>ROUNDED TO</u>				<u>\$58,000</u>		

Table C.45. DW-14 - R & R old lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install pipe						
Excavate/backfill trench	1,206	LF	\$13.80	\$16,643	A12.3-110-1440	98 Site p. 372
Install 12" pipe bedding	1,327	LF	\$2.03	\$2,693	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	0	LF	\$3.43	\$0	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	1,327	LF	\$28.50	\$37,808	026-660-1020	98 Site p. 82
install 12" shut off valves	2	EA	\$1,375.00	\$2,750	026-404-3340	98 Site p. 78
Install 16" diameter black steel pipe	0	LF	\$35.00	\$0	estimated	
install 16" shut off valves	0	EA	\$2,800.00	\$0	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
	Total:			\$59,894		
Remove exisiting pipe						
Saw cut pavement	2,420	LF	\$3.89	\$9,414	020-728-0020	98 Fac p.48
Remove 12' pipe	1215	LF	\$6.15	\$7,472	020-554-2900	98 Site p. 28
Remove 16" pipe	0	LF	\$7.35	\$0	CERL estimate	98 Site p. 28
Remove 18" pipe	0	LF	\$7.75	\$0	CERL estimate	98 Site p. 28
Rubbish handling	224	CY	\$14.40	\$3,221	020-620-3080	98 Site p. 29
Haul debris to dump	224	CY	\$12.80	\$2,863	020-620-5000	98 Site p. 29
Disposal fee for debris	224	CY	\$6.00	\$1,342	CERL estimate	
	Total:			\$24,312		
Install fire hydrants						
Install new hydrants		EA	\$3,810.00	\$0	A12.3-922-1300	98 Site p. 382
R & R existing hydrants	4	EA	\$1,050.00	\$4,200	020-550-0950	98 Site p. 27
	Total:			\$4,200		
Repair roadway						
Install and compact 6" crushed stone base ma	536	SY	\$9.75	\$5,226	022-308-0100	98 Site p. 53
Install 3" binder course	536	SY	\$5.30	\$2,841	025-104-0160	98 Site p.67
Install 3" wearing course	536	SY	\$6.20	\$3,323	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	536	CY	\$0.47	\$252	022-226-5020	96 Site&Work
	Total:			\$11,642		
SUBTOTAL				\$100,048		
City cost index	93.70%			\$93,745		
TOTAL						
TOTAL with contingency of:	10%		\$9,374	\$103,119		
TOTAL with contingency of:	30%		\$28,123	\$121,868		
ROUNDED TO				\$103,000		
ROUNDED TO				\$122,000		

Table C.46. DW-15 - R & R old water lines with new (N. 10th to Link-18).

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install pipe						
Excavate/backfill trench	1,658	LF	\$13.80	\$22,876	A12.3-110-1440	98 Site p. 372
Install 12" pipe bedding	1,658	LF	\$2.03	\$3,365	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	0	LF	\$3.43	\$0	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	1,658	LF	\$28.50	\$47,244	026-660-1020	98 Site p. 82
install 12" shut off valves	3	EA	\$1,375.00	\$4,125	026-404-3340	98 Site p. 78
Install 16" diameter black steel pipe	0	LF	\$35.00	\$0	estimated	
install 16" shut off valves	0	EA	\$2,800.00	\$0	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
	Total				\$77,611	
Remove existing pipe						
Saw cut pavement	3,323	LF	\$3.89	\$12,928	020-728-0020	98 Fac p.48
Remove 12' pipe	1507	LF	\$6.15	\$9,268	020-554-2900	98 Site p. 28
Remove 16" pipe	1438	LF	\$7.35	\$10,569	CERL estimate	98 Site p. 28
Remove 18" pipe	0	LF	\$7.75	\$0	CERL estimate	98 Site p. 28
Rubbish handling	396	CY	\$14.40	\$5,704	020-620-3080	98 Site p. 28
Haul debris to dump	396	CY	\$12.80	\$5,070	020-620-5000	98 Site p. 29
Disposal fee for debris	396	CY	\$6.00	\$2,376	CERL estimate	98 Site p. 29
	Total				\$45,915	
Install fire hydrants						
Install new hydrants		EA	\$3,810.00	\$0	A12.3-922-1300	98 Site p. 382
R & R existing hydrants	6	EA	\$1,050.00	\$6,300	020-550-0950	98 Site p. 27
	Total				\$6,300	
Repair roadway						
Install and compact 6" crushed stone base m	737	SY	\$9.75	\$7,183	022-308-0100	98 Site p. 53
Install 3" binder course	737	SY	\$5.30	\$3,905	025-104-0160	98 Site p.67
Install 3" wearing course	737	SY	\$6.20	\$4,568	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	737	CY	\$0.47	\$346	022-226-5020	96 Site&Work
	Total				\$16,002	
SUBTOTAL					\$145,829	
City cost index					\$136,641	
TOTAL					\$136,641	
TOTAL with contingency of:					\$150,305	
TOTAL with contingency of:					\$40,992	
ROUNDED TO					\$177,634	
ROUNDED TO					\$150,000	
					\$178,000	

Table C.47. DW-15 - R & R old 14-in. water lines along McCloskey with new (N 10th to Link-18).

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	1,646	LF	\$13.80	\$22,709	A12.3-110-1440	98 Site p. 372
Install 12" pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	1,646	LF	\$3.43	\$5,644	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	0	LF	\$28.50	\$0	026-660-1020	98 Site p. 82
install 12" shut off valves	0	EA	\$1,375.00	\$0	026-404-3340	98 Site p. 78
Install 16" diameter black steel pipe	1,646	LF	\$35.00	\$57,596	estimated	
install 16" shut off valves	3	EA	\$2,800.00	\$8,400	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
		Total				\$94,350
<i>Remove existing pipe</i>						
Saw cut pavement	3,299	LF	\$3.89	\$12,834	020-728-0020	98 Fac p.48
Remove 12' pipe	0	LF	\$6.15	\$0	020-554-2900	98 Site p. 28
Remove 16" pipe	1438	LF	\$7.35	\$10,569	CERL estimate	98 Site p. 28
Remove 18" pipe	0	LF	\$7.75	\$0	CERL estimate	98 Site p. 28
Rubbish handling	338	CY	\$14.40	\$4,874	020-620-3080	98 Site p. 29
Haul debris to dump	338	CY	\$12.80	\$4,332	020-620-5000	98 Site p. 29
Disposal fee for debris	338	CY	\$6.00	\$2,031	CERL estimate	
		Total				\$34,641
<i>Install fire hydrants</i>						
Install new hydrants		EA	\$3,810.00	\$0	A12.3-922-1300	98 Site p. 382
R & R existing hydrants	5	EA	\$1,050.00	\$5,250	020-550-0950	98 Site p. 27
		Total				\$5,250
<i>Repair roadway</i>						
Install and compact 6" crushed stone base m	731	SY	\$9.75	\$7,131	022-308-0100	98 Site p. 53
Install 3" binder course	731	SY	\$5.30	\$3,876	025-104-0160	98 Site p.67
Install 3" wearing course	731	SY	\$6.20	\$4,535	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	731	CY	\$0.47	\$344	022-226-5020	96 Site&Work
		Total				\$15,886
SUBTOTAL				\$150,126		
City cost index		93.70%				
TOTAL				\$140,668		
TOTAL with contingency of:		10%		\$14,067	\$154,735	
TOTAL with contingency of:		30%		\$42,200	\$182,868	
<u>ROUNDED TO</u>					<u>\$155,000</u>	
<u>ROUNDED TO</u>					<u>\$183,000</u>	

Table C.48. DW-16 - R & R lines between Link-18 and west of S. Hutton.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	701	LF	\$13.80	\$9,670	A12.3-110-1440	98 Site p. 372
Remove old pipe	0	LF	\$6.10	\$1	020-554-2900	97 Site p. 28
Install 12" pipe bedding	701	LF	\$2.03	\$1,422	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	0	LF	\$3.43	\$0	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	701	LF	\$28.50	\$19,970	026-660-1020	98 Site p. 82
install 12" shut off valves	1	EA	\$1,375.00	\$1,375	026-404-3340	98 Site p. 78
Install 16" diameter black steel pipe	0	LF	\$35.00	\$0	estimated	
install 16" shut off valves	0	EA	\$2,800.00	\$0	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
						\$32,438
<i>Remove exisiting pipe</i>						
Remove 12' pipe	159.25	LF	\$6.15	\$979	020-554-2900	98 Site p. 28
Remove 16" pipe	0	LF	\$7.35	\$0	CERL estimate	98 Site p. 28
Remove 18" pipe	0	LF	\$7.75	\$0	CERL estimate	98 Site p. 28
Rubbish handling	32	CY	\$14.40	\$459	020-620-3080	98 Site p. 29
Haul debris to dump	32	CY	\$12.80	\$408	020-620-5000	98 Site p. 29
Disposal fee for debris	32	CY	\$6.00	\$191	CERL estimate	
						\$2,037
<i>Install fire hydrants</i>						
Install new hydrants		EA	\$3,810.00		A12.3-922-1300	98 Site p. 382
R & R existing hydrants	2	EA	\$1,050.00	\$2,100	020-550-0950	98 Site p. 27
						\$2,100
<i>Repair roadway</i>						
Install and compact 6" crushed stone base m	78	SY	\$9.75	\$759	022-308-0100	98 Site p. 53
Install 3" binder course	78	SY	\$5.30	\$413	025-104-0160	98 Site p.67
Install 3" wearing course	78	SY	\$6.20	\$483	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	78	CY	\$0.47	\$37	022-226-5020	96 Site&Work
						\$1,691
SUBTOTAL				\$38,265		
City cost index	93.70%					
TOTAL				\$35,855		
TOTAL with contingency of:	10%		\$3,585	\$39,440		
TOTAL with contingency of:	30%		\$10,756	\$46,611		
<u>ROUNDED TO</u>				<u>\$39,000</u>		
<u>ROUNDED TO</u>				<u>\$47,000</u>		

Table C.49. DW-16 - R & R lines between Link-18 and west of S. Hutton.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	1,342	LF	\$13.80	\$18,520	A12.3-110-1440	98 Site p. 372
Remove old pipe	0	LF	\$6.10	\$1	020-554-2900	97 Site p. 28
Install 12" pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	1,342	LF	\$3.43	\$4,603	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	0	LF	\$28.50	\$0	026-660-1020	98 Site p. 82
install 12" shut off valves	0	EA	\$1,375.00	\$0	026-404-3340	98 Site p. 78
Install 16" diameter black steel pipe	1,342	LF	\$35.00	\$46,970	estimated	
install 16" shut off valves	2	EA	\$2,800.00	\$5,600	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
		Total				\$75,693
<i>Remove exisiting pipe</i>						
Remove 12' pipe	0	LF	\$6.15	\$0	020-554-2900	98 Site p. 28
Remove 16" pipe	305	LF	\$7.35	\$2,242	CERL estimate	98 Site p. 28
Remove 18" pipe	0	LF	\$7.75	\$0	CERL estimate	98 Site p. 28
Rubbish handling	70	CY	\$14.40	\$1,005	020-620-3080	98 Site p. 29
Haul debris to dump	70	CY	\$12.80	\$893	020-620-5000	98 Site p. 29
Disposal fee for debris	70	CY	\$6.00	\$419	CERL estimate	
		Total				\$4,559
<i>Install fire hydrants</i>						
Install new hydrants		EA	\$3,810.00		A12.3-922-1300	98 Site p. 382
R & R existing hydrants	4	EA	\$1,050.00	\$4,200	020-550-0950	98 Site p. 27
		Total				\$4,200
<i>Repair roadway</i>						
Install and compact 6" crushed stone base m	149	SY	\$9.75	\$1,454	022-308-0100	98 Site p. 53
Install 3" binder course	149	SY	\$5.30	\$790	025-104-0160	98 Site p.67
Install 3" wearing course	149	SY	\$6.20	\$924	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	149	CY	\$0.47	\$70	022-226-5020	96 Site&Work
		Total				\$3,239
SUBTOTAL				\$87,691		
City cost index	93.70%					
TOTAL				\$82,166		
TOTAL with contingency of:	10%		\$8,217	\$90,383		
TOTAL with contingency of:	30%		\$24,650	\$106,816		
<u>ROUNDED TO</u>				\$90,000		
<u>ROUNDED TO</u>				\$107,000		

Table C.50. DW-17 - R & R water lines to Peoria Street.

Table C-51 DW-17 - B & R lines to pump house and Peoria Street.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install pipe						
Excavate/backfill trench	1,071	LF	\$13.80	\$14,785	A12.3-110-1440	98 Site p. 372
Install 12" pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	0	LF	\$3.43	\$0	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	1,071	LF	\$3.50	\$3,750	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	0	LF	\$28.50	\$0	026-660-1020	98 Site p. 82
install 12" shut off valves	0	EA	\$1,375.00	\$0	026-404-3340	98 Site p. 78
Install 16" diameter black steel pipe	0	LF	\$35.00	\$0	estimated	
install 16" shut off valves	0	EA	\$2,800.00	\$0	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	1,071	LF	\$37.00	\$39,642	026-660-1030	98 Site p. 82
install 18" shut off valves	2	EA	\$3,550.00	\$7,100	026-404-3460	98 Site p. 78
	Total				\$65,277	
Install Pressure Reduction Valves						
Install valve and backup	2	EA	\$10,000.00	\$20,000	CERL estimate	
	Total				\$20,000	
Remove existing pipe						
Saw cut pavement	2,151	LF	\$3.89	\$8,367	020-728-0020	98 Fac p.48
Remove 12' pipe	0	LF	\$6.15	\$0	020-554-2900	98 Site p. 28
Remove 16" pipe	0	LF	\$7.35	\$0	CERL estimate	98 Site p. 28
Remove 18" pipe	974	LF	\$7.75	\$7,549	CERL estimate	98 Site p. 28
Rubbish handling	240	CY	\$14.40	\$3,454	020-620-3080	98 Site p. 29
Haul debris to dump	240	CY	\$12.80	\$3,071	020-620-5000	98 Site p. 29
Disposal fee for debris	240	CY	\$6.00	\$1,439	CERL estimate	
	Total				\$23,880	
Install fire hydrants						
Install new hydrants		EA	\$3,810.00	\$0	A12.3-922-1300	98 Site p. 382
R & R existing hydrants	4	EA	\$1,050.00	\$4,200	020-550-0950	98 Site p. 27
	Total				\$4,200	
Repair roadway						
Install and compact 6" crushed stone base m	476	SY	\$9.75	\$4,643	022-308-0100	98 Site p. 53
Install 3" binder course	476	SY	\$5.30	\$2,524	025-104-0160	98 Site p.67
Install 3" wearing course	476	SY	\$6.20	\$2,952	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	476	CY	\$0.47	\$224	022-226-5020	96 Site&Work
	Total				\$10,343	
SUBTOTAL					\$123,699	
City cost index					\$115,906	
TOTAL						
TOTAL with contingency of:		10%	\$11,591	\$127,497		
TOTAL with contingency of:		30%	\$34,772	\$150,678		
ROUNDED TO					\$127,000	
ROUNDED TO					\$151,000	

Table C.52. DW-18 - R & R old lines and make connection with Golf Course line (Link 10).

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install pipe						
Excavate/backfill trench	1,977	LF	\$13.80	\$27,278	A12.3-110-1440	98 Site p. 372
Install 12" pipe bedding	1,977	LF	\$2.03	\$4,013	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	0	LF	\$3.43	\$0	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	1,977	LF	\$28.50	\$56,336	026-660-1020	98 Site p. 82
install 12" shut off valves	4	EA	\$1,375.00	\$5,500	026-404-3340	98 Site p. 78
Install 16" diameter black steel pipe	0	LF	\$35.00	\$0	estimated	
install 16" shut off valves	0	EA	\$2,800.00	\$0	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
		Total				\$93,127
Remove existing pipe						
Saw cut pavement	1,629	LF	\$3.89	\$6,336	020-728-0020	98 Fac p.48
Remove 12' pipe	634	LF	\$6.15	\$3,899	020-554-2900	98 Site p. 28
Remove 16" pipe	0	LF	\$7.35	\$0	CERL estimate	98 Site p. 28
Remove 18* pipe	0	LF	\$7.75	\$0	CERL estimate	98 Site p. 28
Rubbish handling	144	CY	\$14.40	\$2,067	020-620-3080	98 Site p. 28
Haul debris to dump	144	CY	\$12.80	\$1,837	020-620-5000	98 Site p. 29
Disposal fee for debris	144	CY	\$6.00	\$861	CERL estimate	98 Site p. 29
		Total				\$15,001
Install fire hydrants						
Install new hydrants	2	EA	\$3,810.00	\$7,620	A12.3-922-1300	98 Site p. 382
R & R existing hydrants	3	EA	\$1,050.00	\$3,150	020-550-0950	98 Site p. 27
		Total				\$10,770
Repair roadway						
Install and compact 6" crushed stone base ma	360	SY	\$9.75	\$3,512	022-308-0100	98 Site p. 53
Install 3" binder course	360	SY	\$5.30	\$1,909	025-104-0160	98 Site p.67
Install 3" wearing course	360	SY	\$6.20	\$2,233	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	360	CY	\$0.47	\$169	022-226-5020	96 Site&Work
		Total				\$7,824
SUBTOTAL				\$126,722		
City cost index						
TOTAL				\$118,738		
TOTAL with contingency of:						
TOTAL with contingency of:						
ROUNDED TO				\$131,000		
ROUNDED TO				\$154,000		

Table C.53. DW-18 - R & R old lines and make connection with Golf Course line (Link-10).

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install pipe						
Excavate/backfill trench	2,035	LF	\$13.80	\$28,083	A12.3-110-1440	98 Site p. 372
Install 12" pipe bedding	2,035	LF	\$2.03	\$4,131	A12.3-310-1500	98 Site p. 375
Install 16" pipe bedding	0	LF	\$3.43	\$0	A12.3-310-1560	98 Site p. 375
Install 18" pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Site p. 375
Install 12" diameter black steel pipe	2,035	LF	\$28.50	\$57,998	026-660-1020	98 Site p. 82
install 12" shut off valves	4	EA	\$1,375.00	\$5,500	026-404-3340	98 Site p. 78
Install 16" diameter black steel pipe	0	LF	\$35.00	\$0	estimated	
install 16" shut off valves	0	EA	\$2,800.00	\$0	026-404-3440	98 Site p. 78
Install 18" diameter black steel pipe	0	LF	\$37.00	\$0	026-660-1030	98 Site p. 82
install 18" shut off valves	0	EA	\$3,550.00	\$0	026-404-3460	98 Site p. 78
						\$95,712
Remove existing pipe						
Saw cut pavement	4,078	LF	\$3.89	\$15,863	020-728-0020	98 Fac p.48
Remove 12" pipe	634	LF	\$6.15	\$3,899	020-554-2900	98 Site p. 28
Remove 16" pipe	0	LF	\$7.35	\$0	CERL estimate	98 Site p. 28
Remove 18" pipe	0	LF	\$7.75	\$0	CERL estimate	98 Site p. 28
Rubbish handling	325	CY	\$14.40	\$4,679	020-620-3080	98 Site p. 29
Haul debris to dump	325	CY	\$12.80	\$4,160	020-620-5000	98 Site p. 29
Disposal fee for debris	325	CY	\$6.00	\$1,950	CERL estimate	
						\$30,551
Install fire hydrants						
Install new hydrants	2	EA	\$3,810.00	\$7,620	A12.3-922-1300	98 Site p. 382
R & R existing hydrants	3	EA	\$1,050.00	\$3,150	020-550-0950	98 Site p. 27
						\$10,770
Repair roadway						
Install and compact 6" crushed stone base m	904	SY	\$9.75	\$8,818	022-308-0100	98 Site p. 53
Install 3" binder course	904	SY	\$5.30	\$4,794	025-104-0160	98 Site p.67
Install 3" wearing course	904	SY	\$6.20	\$5,608	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	904	CY	\$0.47	\$425	022-226-5020	96 Site&Work
						\$19,645
SUBTOTAL				\$156,677		
City cost index						
TOTAL				\$146,807		
TOTAL with contingency of:				\$161,487		
TOTAL with contingency of:				\$190,849		
ROUNDED TO				\$161,000		
ROUNDED TO				\$191,000		

Table C.54. Fitzsimons summary sheet for wet utilities.

Item	FRA	Chargeable Proj %/Ph	Evaluation of FRA Proposal				CERL's Alternative Scenario (CERL 1) Estimates			
			Total Project Estimate		Chargeable Estimate		Total Project Estimate		Chargeable Estimate	
			CERL-Low	CERL-High	CERL-Low	CERL-High	CERL-Low	CERL-High	CERL-Low	CERL-High
Domestic Water										
Phase 1	\$171,720	\$65,477	\$154,000	\$181,000	\$58,720	\$69,015	\$127,000	\$151,000	\$48,425	\$57,576
Phase 2	\$1,057,104	\$403,074	\$914,000	\$1,082,000	\$348,508	\$412,567	\$969,000	\$1,143,000	\$369,480	\$435,826
Phase 3	\$354,240	\$135,072	\$328,000	\$387,000	\$125,066	\$147,563	\$301,000	\$355,000	\$114,771	\$135,362
Phase 4	\$167,616	\$63,912	\$153,000	\$181,000	\$58,339	\$69,015	\$153,000	\$181,000	\$58,339	\$69,015
Total	\$1,750,680	\$667,534	\$1,549,000	\$1,831,000	\$590,634	\$698,160	\$1,550,000	\$1,830,000	\$591,015	\$697,779
Research Park	\$796,000	\$796,000	\$796,000	\$796,000	\$796,000	\$796,000	\$660,000	\$660,000	\$660,000	\$660,000
EDC Total	\$2,547,000	\$1,464,000	\$2,345,000	\$2,627,000	\$1,387,000	\$1,494,000	\$2,210,000	\$2,490,000	\$1,251,000	\$1,358,000
Sanitary Sewer										
Phase 1	\$324,117	\$128,836	\$176,000	\$207,000	\$69,960	\$82,283	\$83,600	\$98,800	\$33,231	\$39,273
Phase 2	\$657,321	\$261,285	\$472,000	\$558,000	\$187,620	\$221,805	\$183,000	\$217,000	\$72,743	\$86,258
Phase 3	\$115,652	\$45,972	\$73,000	\$86,000	\$29,018	\$34,185	\$40,000	\$48,000	\$15,900	\$19,080
Phase 4	\$64,593	\$25,676	\$40,000	\$47,000	\$15,900	\$18,683	\$51,000	\$61,000	\$20,273	\$24,248
Total	\$1,161,682	\$461,768	\$761,000	\$898,000	\$302,498	\$356,955	\$357,600	\$424,800	\$142,146	\$168,858
Research Park	\$464,000	\$464,000	\$464,000	\$464,000	\$464,000	\$464,000	\$385,000	\$385,000	\$385,000	\$385,000
EDC Total	\$1,626,000	\$926,000	\$1,225,000	\$1,362,000	\$766,000	\$821,000	\$743,000	\$810,000	\$527,000	\$554,000
Storm Water										
Phase 1	\$179,464	\$67,568	\$176,000	\$208,000	\$66,284	\$78,312	\$176,000	\$208,000	\$66,264	\$78,312
Phase 2	\$1,903,982	\$716,849	\$1,423,000	\$1,694,000	\$535,760	\$637,791	\$1,054,000	\$1,245,000	\$396,831	\$468,743
Phase 3	\$220,968	\$83,194	\$182,000	\$215,000	\$68,523	\$80,948	\$182,000	\$215,000	\$68,523	\$80,948
Phase 4	\$955,656	\$359,804	\$295,000	\$361,000	\$111,068	\$135,917	\$238,000	\$289,000	\$89,607	\$108,809
Total	\$3,260,070	\$1,227,416	\$2,076,000	\$2,478,000	\$781,614	\$932,967	\$1,650,000	\$1,957,000	\$621,225	\$736,811
Research Park	\$531,000	\$531,000	\$531,000	\$531,000	\$531,000	\$531,000	\$440,000	\$440,000	\$440,000	\$440,000
EDC Total	\$3,791,000	\$1,758,000	\$2,607,000	\$3,009,000	\$1,313,000	\$1,464,000	\$2,090,000	\$2,397,000	\$1,061,000	\$1,177,000
FRA Projects										
Research Park	\$6,172,000	\$2,357,000	\$4,386,000	\$5,207,000	\$1,675,000	\$1,988,000	\$3,559,000	\$4,212,000	\$1,354,000	\$1,603,000
EDC Total	\$7,963,000	\$4,148,000	\$1,791,000	\$6,177,000	\$1,791,000	\$1,791,000	\$1,485,000	\$1,485,000	\$1,485,000	\$1,485,000
Totals for Evaluation of FRA Proposal										
CERL 1 Comparison for All Wet Utilities										
FRA Projects	\$6,172,000	\$2,357,000	\$4,386,000	\$5,207,000	\$1,675,000	\$1,988,000	\$3,559,000	\$4,212,000	\$1,354,000	\$1,603,000
Research Park	\$1,791,000	\$1,791,000	\$1,791,000	\$1,791,000	\$1,791,000	\$1,791,000	\$1,485,000	\$1,485,000	\$1,485,000	\$1,485,000
EDC Total	\$7,963,000	\$4,148,000	\$6,177,000	\$6,998,000	\$3,466,000	\$3,779,000	\$5,043,000	\$5,697,000	\$2,899,000	\$3,088,000

Table C.55. SW-1 - Install new storm sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	1,543	LF	\$13.35	\$20,603	A12.3-110-1440	97 Site p. 360
Install pipe bedding	1,543	LF	\$1.52	\$2,346	A12.3-310-1460	97 Site p. 363
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install 18" concrete pipe	1,403	LF	\$19.80	\$27,779	027-162-2030	97 Site p. 92
Install 21" concrete pipe	0	LF	\$23.50	\$0	027-162-2035	97 Site p. 92
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install 30" concrete pipe	0	LF	\$55.50	\$0	027-162-2050	97 Site p. 92
						\$50,728
<i>Install catch basins</i>						
Install catch basins	2	EA	\$1,535.00	\$3,070	A12.3-710-5820	97 Site p. 365
						\$3,070
<i>Install manholes</i>						
Install manholes	3	EA	\$1,495.00	\$4,485	A12.3-710-5820	98 Site p. 377
						\$4,485
<i>Improve drainage by adding culverts</i>						
Saw cut asphalt	0	LF	\$3.78	\$0	020-728-0010 + 02	98 Site p. 34
Remove asphalt	0	SY	\$6.10	\$0	020-554-1750	98 Site p. 28
Excavate/backfill trench	146	LF	\$13.80	\$2,015	A12.3-110-1440	98 Heavy p. 330
Add 42" culvert	1	LF	\$88.50	\$12,213	027-162-2070	98 Heavy p. 99
Install pipe bedding	138	LF	\$12.48	\$1,722	A12.3-310-1720	98 Heavy p. 333
Install headwalls	2	EA	\$2,570.00	\$5,140	A12.3-750-2040	98 Heavy p. 337
Excavate/backfill trench	1	LF	\$13.80	\$18	A12.3-110-1440	98 Heavy p. 330
Add 42" culvert	0	LF	\$88.50	\$83	027-162-2070	98 Heavy p. 99
Install pipe bedding	1	LF	\$12.48	\$12	A12.3-310-1720	98 Heavy p. 333
Install headwalls	0	EA	\$2,570.00	\$0	A12.3-750-2040	98 Heavy p. 337
Excavate/backfill trench	146	LF	\$13.80	\$2,015	A12.3-110-1440	98 Heavy p. 330
Add twin 6X6 culvert	2	LF	\$269.00	\$78,548	027-162-0050	98 Heavy p. 98
Install pipe bedding	292	LF	\$12.48	\$3,644	A12.3-310-1720	98 Heavy p. 333
Install headwalls	2	EA	\$6,225.00	\$12,450	A12.3-750-2040	98 Heavy p. 337
Install 4" binder course	0	SY	\$6.95	\$0	025-104-0200	98 Site p. 67
Install 4" wearing course	0	SY	\$8.43	\$0	025-104-0340 + 02	98 Site p. 68
Compact asphalt	0	CY	\$0.31	\$0	022-226 5000	96 Site&Work
						\$117,860
SUBTOTAL				\$176,143		
City cost index						
TOTAL				\$165,046		
TOTAL with contingency of:				\$181,550		
TOTAL with contingency of:				\$214,560		
ROUNDED TO				\$182,000		
ROUNDED TO				\$215,000		

Table C.56. SW-3 - Install new storm sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	319	LF	\$13.80	\$4,402	A12.3-110-1440	98 Heavy p.330
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
Install 30" concrete pipe	0	LF	\$55.50	\$0	027-162-2050	97 Site p. 92
Install pipe bedding	0	LF	\$5.35	\$0	A12.3-310-1660	98 Heavy p.333
Install 36" concrete pipe	0	LF	\$77.00	\$0	027-162-2060	98 Heavy p.99
Install pipe bedding	0	LF	\$9.61	\$0	A12.3-310-1700	98 Heavy p.333
Install 42" concrete pipe	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p.99
Install pipe bedding	0	LF	\$12.00	\$0	est	98 Heavy p.333
Install 48" concrete pipe	0	LF	\$105.00	\$0	027-162-2080	98 Heavy p.99
Install pipe bedding	0	LF	\$12.49	\$0	A12.3-310-1720	98 Heavy p.333
Install 60" concrete pipe (requires 54")	290	LF	\$138.00	\$40,020	027-162-2090	98 Heavy p.99
Install pipe bedding	290	LF	\$15.57	\$4,515	A12.3-310-1740	98 Heavy p.333
Install 72" concrete pipe	0	LF	\$184.00	\$0	027-162-22100	98 Heavy p.99
Install pipe bedding	0	LF	\$22.50	\$0	A12.3-310-1760	98 Heavy p.333
	Total				\$48,938	
<i>Install manholes</i>						
Install manholes		Total	1 EA	\$1,495.00	\$1,495	A12.3-710-5820 \$1,495
SUBTOTAL					\$50,433	
City cost index					\$47,255	
TOTAL						
TOTAL with contingency of:			10%		\$51,981	
TOTAL with contingency of:			30%		\$61,432	
<i>ROUNDED TO</i>					<u>\$52,000</u>	
<i>ROUNDED TO</i>					<u>\$61,000</u>	

Table C.57. SW-6 - Install new storm sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	1,059	LF	\$13.80	\$14,618	A12.3-110-1440	98 Heavy p.330
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	499	LF	\$19.80	\$9,880	027-162-2030	97 Site p. 92
Install pipe bedding	499	LF	\$3.50	\$1,747	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
Install 30" concrete pipe	464	LF	\$55.50	\$25,752	027-162-2050	97 Site p. 92
Install pipe bedding	464	LF	\$5.35	\$2,482	A12.3-310-1660	98 Heavy p.333
Install 36" concrete pipe	0	LF	\$77.00	\$0	027-162-2060	98 Heavy p.99
Install pipe bedding	0	LF	\$9.61	\$0	A12.3-310-1700	98 Heavy p.333
Install 42" concrete pipe	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p.99
Install pipe bedding	0	LF	\$12.00	\$0	est	98 Heavy p.333
Install 48" concrete pipe	0	LF	\$105.00	\$0	027-162-2080	98 Heavy p.99
Install pipe bedding	0	LF	\$12.49	\$0	A12.3-310-1720	98 Heavy p.333
Install 60" concrete pipe (requires 54")	0	LF	\$138.00	\$0	027-162-2090	98 Heavy p.99
Install pipe bedding	0	LF	\$15.57	\$0	A12.3-310-1740	98 Heavy p.333
Install 72" concrete pipe	0	LF	\$184.00	\$0	027-162-22100	98 Heavy p.99
Install pipe bedding	0	LF	\$22.50	\$0	A12.3-310-1760	98 Heavy p.333
		Total		\$54,479		
<i>Install manholes</i>						
Install manholes	2	EA	\$1,495.00	\$2,990	A12.3-710-5820	98 Site p. 377
		Total		\$2,990		
SUBTOTAL				\$57,469		
City cost index				\$53,849		
TOTAL				\$53,849		
TOTAL with contingency of:		10%		\$59,234		
TOTAL with contingency of:		30%		\$70,004		
ROUNDED TO				\$59,000		
ROUNDED TO				\$70,000		

Table C.58. SW-7 - Install new storm sewer lines

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install pipe						
Excavate/backfill trench	1,236	LF	\$13.80	\$17,062	A12.3-110-1440	98 Heavy p.330
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	417	LF	\$29.00	\$12,093	027-162-2040	97 Site p. 92
Install pipe bedding	417	LF	\$5.23	\$2,181	A12.3-310-1640	98 Heavy p.333
Install 30" concrete pipe	394	LF	\$55.50	\$21,867	027-162-2050	97 Site p. 92
Install pipe bedding	394	LF	\$5.35	\$2,108	A12.3-310-1660	98 Heavy p.333
Install 36" concrete pipe	0	LF	\$77.00	\$0	027-162-2060	98 Heavy p.99
Install pipe bedding	0	LF	\$9.61	\$0	A12.3-310-1700	98 Heavy p.333
Install 42" concrete pipe	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p.99
Install pipe bedding	0	LF	\$12.00	\$0	est	98 Heavy p.333
Install 48" concrete pipe	313	LF	\$105.00	\$32,865	027-162-2080	98 Heavy p.99
Install pipe bedding	313	LF	\$12.49	\$3,909	A12.3-310-1720	98 Heavy p.333
Install 60" concrete pipe (requires 54")	0	LF	\$138.00	\$0	027-162-2090	98 Heavy p.99
Install pipe bedding	0	LF	\$15.57	\$0	A12.3-310-1740	98 Heavy p.333
Install 72" concrete pipe	0	LF	\$184.00	\$0	027-162-22100	98 Heavy p.99
Install pipe bedding	0	LF	\$22.50	\$0	A12.3-310-1760	98 Heavy p.333
	Total				\$92,086	
Install catch basins						
Install catch basins	22	EA	\$1,535.00	\$33,770	A12.3-710-5820	97 Site p. 365
	Total				\$33,770	
Install manholes						
Install manholes	2	EA	\$1,495.00	\$2,990	A12.3-710-5820	98 Site p. 377
	Total				\$2,990	
Remove existing pavement						
Saw cut pavement	2,264	LF	\$3.89	\$8,807	020-728-0020	98 Fac p.48
Rubbish handling	167	CY	\$14.40	\$2,398	020-620-3080	98 Site p. 29
Haul debris to dump	167	CY	\$12.80	\$2,131	020-620-5000	98 Site p. 29
Disposal fee for debris	167	CY	\$6.00	\$999	CERL estimate	
	Total				\$14,335	
Repair roadway						
Install and compact 6" crushed stone base ma	500	SY	\$9.75	\$4,871	022-308-0100	98 Site p. 53
Install 3" binder course	500	SY	\$5.30	\$2,648	025-104-0160	98 Site p.67
Install 3" wearing course	500	SY	\$6.20	\$3,097	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	333	CY	\$0.47	\$157	022-226-5020	96 Site&Work
	Total				\$10,772	
SUBTOTAL					\$153,953	
City cost index					\$144,254	
TOTAL					\$158,679	
TOTAL with contingency of:					\$187,530	
ROUNDED TO					\$159,000	
ROUNDED TO					\$188,000	

Table C.59. SW-8 - Install new storm sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install pipe						
Excavate/backfill trench	1,199	LF	\$13.80	\$16,546	A12.3-110-1440	98 Heavy p.330
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
Install 30" concrete pipe	522	LF	\$55.50	\$28,971	027-162-2050	97 Site p. 92
Install pipe bedding	522	LF	\$5.35	\$2,793	A12.3-310-1660	98 Heavy p.333
Install 36" concrete pipe	568	LF	\$77.00	\$43,736	027-162-2060	98 Heavy p.99
Install pipe bedding	568	LF	\$9.61	\$5,458	A12.3-310-1700	98 Heavy p.333
Install 42" concrete pipe	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p.99
Install pipe bedding	0	LF	\$12.00	\$0	est	98 Heavy p.333
Install 48" concrete pipe	0	LF	\$105.00	\$0	027-162-2080	98 Heavy p.99
Install pipe bedding	0	LF	\$12.49	\$0	A12.3-310-1720	98 Heavy p.333
Install 60" concrete pipe (requires 54")	0	LF	\$138.00	\$0	027-162-2090	98 Heavy p.99
Install pipe bedding	0	LF	\$15.57	\$0	A12.3-310-1740	98 Heavy p.333
Install 72" concrete pipe	0	LF	\$184.00	\$0	027-162-22100	98 Heavy p.99
Install pipe bedding	0	LF	\$22.50	\$0	A12.3-310-1760	98 Heavy p.333
		Total		\$97,504		
Install catch basins						
Install catch basins	22	EA	\$1,535.00	\$33,770	A12.3-710-5820	97 Site p. 365
		Total		\$33,770		
Install manholes						
Install manholes	2	EA	\$1,495.00	\$2,990	A12.3-710-5820	98 Site p. 377
		Total		\$2,990		
Remove existing pavement						
Saw cut pavement	2,196	LF	\$3.89	\$8,542	020-728-0020	98 Fac p.48
Rubbish handling	161	CY	\$14.40	\$2,325	020-620-3080	98 Site p. 29
Haul debris to dump	161	CY	\$12.80	\$2,067	020-620-5000	98 Site p. 29
Disposal fee for debris	161	CY	\$6.00	\$969	CERL estimate	
		Total		\$13,904		
Repair roadway						
Install and compact 6" crushed stone base ma	484	SY	\$9.75	\$4,723	022-308-0100	98 Site p. 53
Install 3" binder course	484	SY	\$5.30	\$2,568	025-104-0160	98 Site p.67
Install 3" wearing course	484	SY	\$6.20	\$3,004	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	323	CY	\$0.47	\$152	022-226-5020	96 Site&Work
		Total		\$10,446		
SUBTOTAL				\$158,614		
City cost index		93.7%				
TOTAL				\$148,622		
TOTAL with contingency of:		10%		\$163,484		
TOTAL with contingency of:		30%		\$193,208		
ROUNDED TO				\$163,000		
ROUNDED TO				\$193,000		

Table C.60. SW-10 - Remove and replace lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	1,313	LF	\$13.80	\$18,125	A12.3-110-1440	98 Heavy p.330
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	1,194	LF	\$19.80	\$23,641	027-162-2030	97 Site p. 92
Install pipe bedding	1,194	LF	\$3.50	\$4,179	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
Install 30" concrete pipe	0	LF	\$55.50	\$0	027-162-2050	97 Site p. 92
Install pipe bedding	0	LF	\$5.35	\$0	A12.3-310-1660	98 Heavy p.333
Install 36" concrete pipe	0	LF	\$77.00	\$0	027-162-2060	98 Heavy p.99
Install pipe bedding	0	LF	\$9.61	\$0	A12.3-310-1700	98 Heavy p.333
Install 42" concrete pipe	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p.99
Install pipe bedding	0	LF	\$12.00	\$0	est	98 Heavy p.333
Install 48" concrete pipe	0	LF	\$105.00	\$0	027-162-2080	98 Heavy p.99
Install pipe bedding	0	LF	\$12.49	\$0	A12.3-310-1720	98 Heavy p.333
Install 60" concrete pipe(requires 54")	0	LF	\$138.00	\$0	027-162-2090	98 Heavy p.99
Install pipe bedding	0	LF	\$15.57	\$0	A12.3-310-1740	98 Heavy p.333
Install 72" concrete pipe	0	LF	\$184.00	\$0	027-162-22100	98 Heavy p.99
Install pipe bedding	0	LF	\$22.50	\$0	A12.3-310-1760	98 Heavy p.333
	Total			\$45,945		
<i>Install manholes</i>						
Install manholes	2	EA	\$1,495.00	\$2,990	A12.3-710-5820	98 Site p. 377
	Total			\$2,990		
SUBTOTAL				\$48,935		
City cost index						
TOTAL				\$45,852		
TOTAL with contingency of:				\$50,437		
TOTAL with contingency of:				\$59,608		
ROUNDED TO				\$50,000		
ROUNDED TO				\$60,000		

Table C.61. SW-11 - Install new storm sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	739	LF	\$13.80	\$10,201	A12.3-110-1440	98 Heavy p.330
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
Install 30" concrete pipe	0	LF	\$55.50	\$0	027-162-2050	97 Site p. 92
Install pipe bedding	0	LF	\$5.35	\$0	A12.3-310-1660	98 Heavy p.333
Install 36" concrete pipe	0	LF	\$77.00	\$0	027-162-2060	98 Heavy p.99
Install pipe bedding	0	LF	\$9.61	\$0	A12.3-310-1700	98 Heavy p.333
Install 42" concrete pipe	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p.99
Install pipe bedding	0	LF	\$12.00	\$0	est	98 Heavy p.333
Install 48" concrete pipe	0	LF	\$105.00	\$0	027-162-2080	98 Heavy p.99
Install pipe bedding	0	LF	\$12.49	\$0	A12.3-310-1720	98 Heavy p.333
Install 60" concrete pipe(requires 54")	672	LF	\$138.00	\$92,736	027-162-2090	98 Heavy p.99
Install pipe bedding	672	LF	\$15.57	\$10,463	A12.3-310-1740	98 Heavy p.333
Install 72" concrete pipe	0	LF	\$184.00	\$0	027-162-22100	98 Heavy p.99
Install pipe bedding	0	LF	\$22.50	\$0	A12.3-310-1760	98 Heavy p.333
	Total			\$113,400		
<i>Install manholes</i>						
Install manholes	1	EA	\$1,495.00	\$1,495	A12.3-710-5820	98 Site p. 377
	Total			\$1,495		
<i>Remove existing pavement</i>						
Saw cut pavement	1,360	LF	\$3.89	\$5,290	020-728-0020	98 Fac p.48
Rubbish handling	100	CY	\$14.40	\$1,434	020-620-3080	98 Site p. 29
Haul debris to dump	100	CY	\$12.80	\$1,274	020-620-5000	98 Site p. 29
Disposal fee for debris	100	CY	\$6.00	\$597	CERL estimate	
	Total			\$8,596		
<i>Repair roadway</i>						
Install and compact 6" crushed stone base ma	299	SY	\$9.75	\$2,912	022-308-0100	98 Site p. 53
Install 3" binder course	299	SY	\$5.30	\$1,583	025-104-0160	98 Site p.67
Install 3" wearing course	299	SY	\$6.20	\$1,852	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	199	CY	\$0.47	\$94	022-226-5020	96 Site&Work
	Total			\$6,440		
SUBTOTAL				\$129,931		
City cost index						
TOTAL				\$121,745		
TOTAL with contingency of:				\$133,920		
TOTAL with contingency of:				\$158,269		
ROUNDED TO				\$134,000		
ROUNDED TO				\$158,000		

Table C.62. SW-12 - Install new storm sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install pipe						
Excavate/backfill trench	497	LF	\$13.80	\$6,861	A12.3-110-1440	98 Heavy p.330
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	244	LF	\$29.00	\$7,076	027-162-2040	97 Site p. 92
Install pipe bedding	244	LF	\$5.23	\$1,276	A12.3-310-1640	98 Heavy p.333
Install 30" concrete pipe	0	LF	\$55.50	\$0	027-162-2050	97 Site p. 92
Install pipe bedding	0	LF	\$5.35	\$0	A12.3-310-1660	98 Heavy p.333
Install 36" concrete pipe	208	LF	\$77.00	\$16,016	027-162-2060	98 Heavy p.99
Install pipe bedding	208	LF	\$9.61	\$1,999	A12.3-310-1700	98 Heavy p.333
Install 42" concrete pipe	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p.99
Install pipe bedding	0	LF	\$12.00	\$0	est	98 Heavy p.333
Install 48" concrete pipe	0	LF	\$105.00	\$0	027-162-2080	98 Heavy p.99
Install pipe bedding	0	LF	\$12.49	\$0	A12.3-310-1720	98 Heavy p.333
Install 60" concrete pipe(requires 54")	0	LF	\$138.00	\$0	027-162-2090	98 Heavy p.99
Install pipe bedding	0	LF	\$15.57	\$0	A12.3-310-1740	98 Heavy p.333
Install 72" concrete pipe	0	LF	\$184.00	\$0	027-162-22100	98 Heavy p.99
Install pipe bedding	0	LF	\$22.50	\$0	A12.3-310-1760	98 Heavy p.333
		Total				\$33,228
Install catch basins						
Install catch basins	9	EA	\$1,535.00	\$13,815	A12.3-710-5820	97 Site p. 365
		Total				\$13,815
Install manholes						
Install manholes	1	EA	\$1,495.00	\$1,495	A12.3-710-5820	98 Site p. 377
		Total				\$1,495
Remove existing pavement						
Saw cut pavement	920	LF	\$3.89	\$3,579	020-728-0020	98 Fac p.48
Rubbish handling	67	CY	\$14.40	\$964	020-620-3080	98 Site p. 29
Haul debris to dump	67	CY	\$12.80	\$857	020-620-5000	98 Site p. 29
Disposal fee for debris	67	CY	\$6.00	\$402	CERL estimate	
		Total				\$5,802
Repair roadway						
Install and compact 6" crushed stone base mat	201	SY	\$9.75	\$1,959	022-308-0100	98 Site p. 53
Install 3" binder course	201	SY	\$5.30	\$1,065	025-104-0160	98 Site p.67
Install 3" wearing course	201	SY	\$6.20	\$1,246	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	134	CY	\$0.47	\$63	022-226-5020	96 Site&Work
		Total				\$4,332
SUBTOTAL						\$58,672
City cost index						
TOTAL						\$54,976
TOTAL with contingency of:		10%		\$60,473		
TOTAL with contingency of:		30%		\$71,469		
ROUNDED TO				\$60,000		
ROUNDED TO				\$71,000		

Table C.63. SW-14 - Install new storm sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install pipe						
Excavate/backfill trench	395	LF	\$13.80	\$5,450	A12.3-110-1440	98 Heavy p.330
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	359	LF	\$29.00	\$10,411	027-162-2040	97 Site p. 92
Install pipe bedding	359	LF	\$5.23	\$1,878	A12.3-310-1640	98 Heavy p.333
Install 30" concrete pipe	0	LF	\$55.50	\$0	027-162-2050	97 Site p. 92
Install pipe bedding	0	LF	\$5.35	\$0	A12.3-310-1660	98 Heavy p.333
Install 36" concrete pipe	0	LF	\$77.00	\$0	027-162-2060	98 Heavy p.99
Install pipe bedding	0	LF	\$9.61	\$0	A12.3-310-1700	98 Heavy p.333
Install 42" concrete pipe	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p.99
Install pipe bedding	0	LF	\$12.00	\$0	est	98 Heavy p.333
Install 48" concrete pipe	0	LF	\$105.00	\$0	027-162-2080	98 Heavy p.99
Install pipe bedding	0	LF	\$12.49	\$0	A12.3-310-1720	98 Heavy p.333
Install 60" concrete pipe (requires 54")	0	LF	\$138.00	\$0	027-162-2090	98 Heavy p.99
Install pipe bedding	0	LF	\$15.57	\$0	A12.3-310-1740	98 Heavy p.333
Install 72" concrete pipe	0	LF	\$184.00	\$0	027-162-22100	98 Heavy p.99
Install pipe bedding	0	LF	\$22.50	\$0	A12.3-310-1760	98 Heavy p.333
	Total			\$17,738		
Install catch basins						
Install catch basins	7	EA	\$1,535.00	\$10,745	A12.3-710-5820	97 Site p. 365
	Total			\$10,745		
Install manholes						
Install manholes	1	EA	\$1,495.00	\$1,495	A12.3-710-5820	98 Site p. 377
	Total			\$1,495		
Remove existing pavement						
Saw cut pavement	734	LF	\$3.89	\$2,855	020-728-0020	98 Fac p.48
Rubbish handling	53	CY	\$14.40	\$766	020-620-3080	98 Site p. 29
Haul debris to dump	53	CY	\$12.80	\$681	020-620-5000	98 Site p. 29
Disposal fee for debris	53	CY	\$6.00	\$319	CERL estimate	
	Total			\$4,621		
Repair roadway						
Install and compact 6" crushed stone base ma	160	SY	\$9.75	\$1,556	022-308-0100	98 Site p. 53
Install 3" binder course	160	SY	\$5.30	\$846	025-104-0160	98 Site p.67
Install 3" wearing course	160	SY	\$6.20	\$989	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	106	CY	\$0.47	\$50	022-226-5020	96 Site&Work
	Total			\$3,441		
SUBTOTAL				\$38,040		
City cost index						
TOTAL				\$35,643		
TOTAL with contingency of:				\$39,208		
TOTAL with contingency of:				\$46,336		
ROUNDED TO				\$39,000		
ROUNDED TO				\$46,000		

Table C.64. SW-16 - Install new storm sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	752	LF	\$13.80	\$10,383	A12.3-110-1440	98 Heavy p.330
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	684	LF	\$19.80	\$13,543	027-162-2030	97 Site p. 92
Install pipe bedding	684	LF	\$3.50	\$2,394	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
Install 30" concrete pipe	0	LF	\$55.50	\$0	027-162-2050	97 Site p. 92
Install pipe bedding	0	LF	\$5.35	\$0	A12.3-310-1660	98 Heavy p.333
Install 36" concrete pipe	0	LF	\$77.00	\$0	027-162-2060	98 Heavy p.99
Install pipe bedding	0	LF	\$9.61	\$0	A12.3-310-1700	98 Heavy p.333
Install 42" concrete pipe	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p.99
Install pipe bedding	0	LF	\$12.00	\$0	est	98 Heavy p.333
Install 48" concrete pipe	0	LF	\$105.00	\$0	027-162-2080	98 Heavy p.99
Install pipe bedding	0	LF	\$12.49	\$0	A12.3-310-1720	98 Heavy p.333
Install 60" concrete pipe (requires 54")	0	LF	\$138.00	\$0	027-162-2090	98 Heavy p.99
Install pipe bedding	0	LF	\$15.57	\$0	A12.3-310-1740	98 Heavy p.333
Install 72" concrete pipe	0	LF	\$184.00	\$0	027-162-22100	98 Heavy p.99
Install pipe bedding	0	LF	\$22.50	\$0	A12.3-310-1760	98 Heavy p.333
		Total		\$26,320		
<i>Install catch basins</i>						
Install catch basins	14	EA	\$1,535.00	\$21,490	A12.3-710-5820	97 Site p. 365
		Total		\$21,490		
<i>Install manholes</i>						
Install manholes	1	EA	\$1,495.00	\$1,495	A12.3-710-5820	98 Site p. 377
		Total		\$1,495		
<i>Remove existing pavement</i>						
Saw cut pavement	1,384	LF	\$3.89	\$5,384	020-728-0020	98 Fac p.48
Rubbish handling	101	CY	\$14.40	\$1,459	020-620-3080	98 Site p. 29
Haul debris to dump	101	CY	\$12.80	\$1,297	020-620-5000	98 Site p. 29
Disposal fee for debris	101	CY	\$6.00	\$608	CERL estimate	
		Total		\$8,748		
<i>Repair roadway</i>						
Install and compact 6" crushed stone base mat	304	SY	\$9.75	\$2,964	022-308-0100	98 Site p. 53
Install 3" binder course	304	SY	\$5.30	\$1,611	025-104-0160	98 Site p.67
Install 3" wearing course	304	SY	\$6.20	\$1,885	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	203	CY	\$0.47	\$95	022-226-5020	96 Site&Work
		Total		\$6,555		
SUBTOTAL				\$64,609		
City cost index						
TOTAL				\$60,538		
TOTAL with contingency of:				\$66,592		
TOTAL with contingency of:				\$78,700		
ROUNDED TO				<u>\$67,000</u>		
ROUNDED TO				<u>\$79,000</u>		

Table C.65. SO1A - Install open ditch and drop structures.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install Swale						
Grade Swale to pond	1,321	LF	\$0.20	\$264	022-702-0010	98 Site p. 55
Erosion control	4,403	SY	\$1.26	\$5,548	022-704-0010	98 Site p. 56
Seed area with grass	40	MSF	\$598.00	\$23,699	A12.7-411-1000	98 Site p. 405
					\$29,511	
Install drop structure						
Install overflow headwall	1	EA	\$2,570.00	\$2,570	A12.3-750-4520	98 Site p. 380
					\$2,570	
Adding culverts(W. Harlow)						
Excavate/backfill trench	0	LF	\$13.80	\$0	A12.3-110-1440	98 Heavy p. 330
Add 42" culvert	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p. 99
Install pipe bedding	0	LF	\$12.48	\$0	A12.3-310-1720	98 Heavy p. 333
Install headwalls	0	EA	\$2,570.00	\$0	A12.3-750-2040	98 Heavy p. 337
Excavate/backfill trench	0	LF	\$13.80	\$0	A12.3-110-1440	98 Heavy p. 330
Add 42" culvert	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p. 99
Install pipe bedding	0	LF	\$12.48	\$0	A12.3-310-1720	98 Heavy p. 333
Install headwalls	0	EA	\$2,570.00	\$0	A12.3-750-2040	98 Heavy p. 337
Excavate/backfill trench	0	LF	\$13.80	\$0	A12.3-110-1440	98 Heavy p. 330
Add twin 6X7 culvert	1	LF	\$289.00	\$84,388	027-162-0150	98 Heavy p. 98
Install pipe bedding	1	LF	\$12.48	\$3,644	A12.3-310-1720	98 Heavy p. 333
Install headwalls	2	EA	\$6,225.00	\$12,450	A12.3-750-2040	98 Heavy p. 337
					\$100,482	
Remove existing pavement						
Saw cut pavement	292	LF	\$3.89	\$1,136	020-728-0020	98 Fac p.48
Rubbish handling	87	CY	\$14.40	\$1,246	020-620-3080	98 Site p. 29
Haul debris to dump	87	CY	\$12.80	\$1,107	020-620-5000	98 Site p. 29
Disposal fee for debris	87	CY	\$6.00	\$519	CERL estimate	
					\$4,008	
Repair roadway						
Install and compact 6" crushed stone base m	260	SY	\$9.75	\$2,531	022-308-0100	98 Site p. 53
Install 3" binder course	260	SY	\$5.30	\$1,376	025-104-0160	98 Site p.67
Install 3" wearing course	260	SY	\$6.20	\$1,609	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	173	CY	\$0.47	\$81	022-226-5020	96 Site&Work
					\$5,597	
SUBTOTAL					\$142,168	
City cost index					\$133,212	
TOTAL						
TOTAL with contingency of:					\$146,533	
TOTAL with contingency of:					\$184,819	
ROUNDED TO					\$147,000	
ROUNDED TO					\$185,000	

Table C.66. SO1B - Install Sand Creek Outfall No. 1

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install Swale						
Grade Swale to pond	1,360	LF	\$0.20	\$272	022-702-0010	98 Site p. 55
Erosion control	4,533	SY	\$1.26	\$5,712	022-704-0010	98 Site p. 56
Seed area with grass	41	MSF	\$598.00	\$24,398	A12.7-411-1000	98 Site p. 405
	Total			\$30,382		
Install drop structure						
Install overflow headwall	1	EA	\$2,570.00	\$2,570	A12.3-750-4520	98 Site p. 380
	Total			\$2,570		
Adding culverts(Golf Road)						
Excavate/backfill trench	0	LF	\$13.80	\$0	A12.3-110-1440	98 Heavy p. 330
Add 42" culvert	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p. 99
Install pipe bedding	0	LF	\$12.48	\$0	A12.3-310-1720	98 Heavy p. 333
Install headwalls	0	EA	\$2,570.00	\$0	A12.3-750-2040	98 Heavy p. 337
Excavate/backfill trench	0	LF	\$13.80	\$0	A12.3-110-1440	98 Heavy p. 337
Add 42" culvert	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p. 99
Install pipe bedding	0	LF	\$12.48	\$0	A12.3-310-1720	98 Heavy p. 333
Install headwalls	0	EA	\$2,570.00	\$0	A12.3-750-2040	98 Heavy p. 337
Excavate/backfill trench	0	LF	\$13.80	\$0	A12.3-110-1440	98 Heavy p. 337
Add twin 6X7 culvert	1	LF	\$289.00	\$84,388	027-162-0150	98 Heavy p. 330
Install pipe bedding	1	LF	\$12.48	\$3,644	A12.3-310-1720	98 Heavy p. 333
Install headwalls	2	EA	\$6,225.00	\$12,450	A12.3-750-2040	98 Heavy p. 337
	Total			\$100,482		
Install retention pond						
Clear and grub/strip land	815	CY	\$0.61	\$497	021-144-0200	97 Site p. 34
Excavate soil	10,593	CY	\$1.00	\$10,593	022-4000	97 Bldg p. 51
Grade soil/shape basin	3,409	SY	\$0.72	\$2,454	025-122-1020	97 Site p. 63
Haul in base material/drainage rock	161	CY	\$12.65	\$2,033	A12.1-618-1200	97 Site p. 353
Install base material/drainage rock	161	CY	\$1.40	\$225	022-262-0010	97 Site p. 46
Install grass bottom	22	MSF	\$321.56	\$7,074	A12.7-411-1000	97 Site p. 393
	Total			\$22,877		
SUBTOTAL				\$156,311		
City cost index	93.7%					
TOTAL				\$146,464		
TOTAL with contingency of:	110%			\$161,110		
TOTAL with contingency of:	130%			\$203,205		
ROUNDED TO				<u>\$161,000</u>		
ROUNDED TO				<u>\$203,000</u>		

Table C.67. SO1B - Install Sand Creek Outfall No. 1.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Adding culverts(Golf Road)</i>						
Excavate/backfill trench	0	LF	\$13.80	\$0	A12.3-110-1440	98 Heavy p. 330
Add 42" culvert	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p. 99
Install pipe bedding	0	LF	\$12.48	\$0	A12.3-310-1720	98 Heavy p. 333
Install headwalls	0	EA	\$2,570.00	\$0	A12.3-750-2040	98 Heavy p. 337
Excavate/backfill trench	0	LF	\$13.80	\$0	A12.3-110-1440	98 Heavy p. 330
Add 42" culvert	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p. 99
Install pipe bedding	0	LF	\$12.48	\$0	A12.3-310-1720	98 Heavy p. 333
Install headwalls	0	EA	\$2,570.00	\$0	A12.3-750-2040	98 Heavy p. 337
Excavate/backfill trench	0	LF	\$13.80	\$0	A12.3-110-1440	98 Heavy p. 330
Add twin 6X7 culvert	1	LF	\$289.00	\$84,388	027-162-0150	98 Heavy p. 98
Install pipe bedding	1	LF	\$12.48	\$3,644	A12.3-310-1720	98 Heavy p. 333
Install headwalls	2	EA	\$6,225.00	\$12,450	A12.3-750-2040	98 Heavy p. 337
						\$100,482
SUBTOTAL				\$100,482		
City cost index	93.7%			\$94,152		
TOTAL						
TOTAL with contingency of:	110%			\$103,567		
TOTAL with contingency of:	130%			\$130,627		
ROUNDED TO				<u>\$104,000</u>		
ROUNDED TO				<u>\$131,000</u>		

Table C.68. SO2 - Install Sand Creek Outfall No. 2

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install Swale						
Grade Swale to pond	200	LF	\$0.20	\$40	022-702-0010	98 Site p. 55
Erosion control	667	SY	\$1.26	\$840	022-704-0010	98 Site p. 56
Seed area with grass	6	MSF	\$598.00	\$3,588	A12.7-411-1000	98 Site p. 405
					\$4,468	
Install drop structure						
Install overflow headwall	1	EA	\$2,570.00	\$2,570	A12.3-750-4520	98 Site p. 380
					\$2,570	
Adding culverts(Golf Road)						
Excavate/backfill trench	0	LF	\$13.80	\$0	A12.3-110-1440	98 Heavy p. 330
Add 42" culvert	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p. 99
Install pipe bedding	0	LF	\$12.48	\$0	A12.3-310-1720	98 Heavy p. 333
Install headwalls	0	EA	\$2,570.00	\$0	A12.3-750-2040	98 Heavy p. 337
Excavate/backfill trench	0	LF	\$13.80	\$0	A12.3-110-1440	98 Heavy p. 337
Add 42" culvert	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p. 99
Install pipe bedding	0	LF	\$12.48	\$0	A12.3-310-1720	98 Heavy p. 333
Install headwalls	0	EA	\$2,570.00	\$0	A12.3-750-2040	98 Heavy p. 337
Excavate/backfill trench	0	LF	\$13.80	\$0	A12.3-110-1440	98 Heavy p. 337
Add twin 6X7 culvert	1	LF	\$289.00	\$0	027-162-0150	98 Heavy p. 330
Install pipe bedding	1	LF	\$12.48	\$0	A12.3-310-1720	98 Heavy p. 98
Install headwalls	2	EA	\$6,225.00	\$12,450	A12.3-750-2040	98 Heavy p. 333
					\$12,450	98 Heavy p. 337
Install retention pond						
Clear and grub/strip land	185	CY	\$0.61	\$113	021-144-0200	97 Site p. 34
Excavate soil	1,481	CY	\$1.00	\$1,481	022-4000	97 Bldg. p. 51
Grade soil/shape basin	856	SY	\$0.72	\$616	025-122-1020	97 Site p. 63
Haul in base material/drainage	50	CY	\$12.65	\$633	A12.1-618-1200	97 Site p. 353
Install base material/drainage	50	CY	\$1.40	\$70	022-262-0010	97 Site p. 46
Install grass bottom	5	MSF	\$321.56	\$1,608	A12.7-411-1000	97 Site p. 393
					\$4,521	
SUBTOTAL						
City cost index	93.7%				\$24,009	
TOTAL					\$22,496	
TOTAL with contingency of:	110%				\$24,746	
TOTAL with contingency of:	130%				\$31,211	
ROUNDED TO					<u>\$25,000</u>	
ROUNDED TO					<u>\$31,000</u>	

Table C.69. DA7 – Install new storm sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install pipe						
Excavate/backfill trench	803	LF	\$13.80	\$11,081	A12.3-110-1440	98 Heavy p.330
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	730	LF	\$19.80	\$14,454	027-162-2030	97 Site p. 92
Install pipe bedding	730	LF	\$3.50	\$2,555	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
Install 30" concrete pipe	0	LF	\$55.50	\$0	027-162-2050	97 Site p. 92
Install pipe bedding	0	LF	\$5.35	\$0	A12.3-310-1660	98 Heavy p.333
Install 36" concrete pipe	0	LF	\$77.00	\$0	027-162-2060	98 Heavy p.99
Install pipe bedding	0	LF	\$9.61	\$0	A12.3-310-1700	98 Heavy p.333
Install 42" concrete pipe	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p.99
Install pipe bedding	0	LF	\$12.00	\$0	est	98 Heavy p.333
Install 48" concrete pipe	0	LF	\$105.00	\$0	027-162-2080	98 Heavy p.99
Install pipe bedding	0	LF	\$12.49	\$0	A12.3-310-1720	98 Heavy p.333
Install 60" concrete pipe (requires 54")	0	LF	\$138.00	\$0	027-162-2090	98 Heavy p.99
Install pipe bedding	0	LF	\$15.57	\$0	A12.3-310-1740	98 Heavy p.333
Install 72" concrete pipe	0	LF	\$184.00	\$0	027-162-22100	98 Heavy p.99
Install pipe bedding	0	LF	\$22.50	\$0	A12.3-310-1760	98 Heavy p.333
		Total		\$28,090		
Install catch basins						
Install catch basins	15	EA	\$1,535.00	\$23,025	A12.3-710-5820	97 Site p. 365
		Total		\$23,025		
Install manholes						
Install manholes	1	EA	\$1,495.00	\$1,495	A12.3-710-5820	98 Site p. 377
		Total		\$1,495		
Remove existing pavement						
Saw cut pavement	1,476	LF	\$3.89	\$5,742	020-728-0020	98 Fac p.48
Rubbish handling	108	CY	\$14.40	\$1,557	020-620-3080	98 Site p. 29
Haul debris to dump	108	CY	\$12.80	\$1,384	020-620-5000	98 Site p. 29
Disposal fee for debris	108	CY	\$6.00	\$649	CERL estimate	
		Total		\$9,332		
Repair roadway						
Install and compact 6" crushed stone base ma	324	SY	\$9.75	\$3,163	022-308-0100	98 Site p. 53
Install 3" binder course	324	SY	\$5.30	\$1,720	025-104-0160	98 Site p.67
Install 3" wearing course	324	SY	\$6.20	\$2,012	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	216	CY	\$0.47	\$102	022-226-5020	96 Site&Work
		Total		\$6,996		
SUBTOTAL				\$68,939		
City cost index		93.7%		\$64,596		
TOTAL				\$64,596		
TOTAL with contingency of:		10%		\$71,055		
TOTAL with contingency of:		30%		\$83,974		
ROUNDED TO				\$71,000		
ROUNDED TO				\$84,000		

Table C.70. DA8 - Install new storm sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	523	LF	\$13.80	\$7,211	A12.3-110-1440	98 Heavy p.330
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	475	LF	\$29.00	\$13,775	027-162-2040	97 Site p. 92
Install pipe bedding	475	LF	\$5.23	\$2,484	A12.3-310-1640	98 Heavy p.333
Install 30" concrete pipe	0	LF	\$55.50	\$0	027-162-2050	97 Site p. 92
Install pipe bedding	0	LF	\$5.35	\$0	A12.3-310-1660	98 Heavy p.333
Install 36" concrete pipe	0	LF	\$77.00	\$0	027-162-2060	98 Heavy p.99
Install pipe bedding	0	LF	\$9.61	\$0	A12.3-310-1700	98 Heavy p.333
Install 42" concrete pipe	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p.99
Install pipe bedding	0	LF	\$12.00	\$0	est	98 Heavy p.333
Install 48" concrete pipe	0	LF	\$105.00	\$0	027-162-2080	98 Heavy p.99
Install pipe bedding	0	LF	\$12.49	\$0	A12.3-310-1720	98 Heavy p.333
Install 60" concrete pipe(requires 54")	0	LF	\$138.00	\$0	027-162-2090	98 Heavy p.99
Install pipe bedding	0	LF	\$15.57	\$0	A12.3-310-1740	98 Heavy p.99
Install 72" concrete pipe	0	LF	\$184.00	\$0	027-162-22100	98 Heavy p.99
Install pipe bedding	0	LF	\$22.50	\$0	A12.3-310-1760	98 Heavy p.333
		Total		\$23,470		
<i>Install manholes</i>						
Install manholes	1	EA	\$1,495.00	\$1,495	A12.3-710-5820	98 Site p. 377
		Total		\$1,495		
<i>Remove existing pavement</i>						
Saw cut pavement	966	LF	\$3.89	\$3,758	020-728-0020	98 Fac p.48
Rubbish handling	70	CY	\$14.40	\$1,013	020-620-3080	98 Site p. 29
Haul debris to dump	70	CY	\$12.80	\$901	020-620-5000	98 Site p. 29
Disposal fee for debris	70	CY	\$6.00	\$422	CERL estimate	
		Total		\$6,094		
<i>Repair roadway</i>						
Install and compact 6" crushed stone base mater	211	SY	\$9.75	\$2,058	022-308-0100	98 Site p. 53
Install 3" binder course	211	SY	\$5.30	\$1,119	025-104-0160	98 Site p.67
Install 3" wearing course	211	SY	\$6.20	\$1,309	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	141	CY	\$0.47	\$66	022-226-5020	96 Site&Work
		Total		\$4,552		
SUBTOTAL				\$35,611		
City cost index						
TOTAL				\$33,368		
TOTAL with contingency of:				\$36,704		
TOTAL with contingency of:				\$43,378		
ROUNDED TO				\$37,000		
ROUNDED TO				\$43,000		

Table C.71. TO1 - Install new storm sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install pipe						
Excavate/backfill trench	1,993	LF	\$13.80	\$27,506	A12.3-110-1440	98 Heavy p.330
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
Install 30" concrete pipe	0	LF	\$55.50	\$0	027-162-2050	97 Site p. 92
Install pipe bedding	0	LF	\$5.35	\$0	A12.3-310-1660	98 Heavy p.333
Install 36" concrete pipe	0	LF	\$77.00	\$0	027-162-2060	98 Heavy p.99
Install pipe bedding	0	LF	\$9.61	\$0	A12.3-310-1700	98 Heavy p.333
Install 42" concrete pipe	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p.99
Install pipe bedding	0	LF	\$12.00	\$0	est	98 Heavy p.333
Install 48" concrete pipe	0	LF	\$105.00	\$0	027-162-2080	98 Heavy p.99
Install pipe bedding	0	LF	\$12.49	\$0	A12.3-310-1720	98 Heavy p.333
Install 60" concrete pipe(requires 54")	1,812	LF	\$138.00	\$250,056	027-162-2090	98 Heavy p.99
Install pipe bedding	1,812	LF	\$15.57	\$28,213	A12.3-310-1740	98 Heavy p.333
Install 72" concrete pipe	0	LF	\$184.00	\$0	027-162-22100	98 Heavy p.99
Install pipe bedding	0	LF	\$22.50	\$0	A12.3-310-1760	98 Heavy p.333
		Total			\$305,775	
Install catch basins						
Install catch basins	18	EA	\$1,535.00	\$27,630	A12.3-710-5820	97 Site p. 365
		Total			\$27,630	
Install manholes						
Install manholes	4	EA	\$1,495.00	\$5,980	A12.3-710-5820	98 Site p. 377
		Total			\$5,980	
Remove existing pavement						
Saw cut pavement	1,820	LF	\$3.89	\$7,080	020-728-0020	98 Fac p.48
Rubbish handling	134	CY	\$14.40	\$1,933	020-620-3080	98 Site p. 29
Haul debris to dump	134	CY	\$12.80	\$1,718	020-620-5000	98 Site p. 29
Disposal fee for debris	134	CY	\$6.00	\$805	CERL estimate	
		Total			\$11,536	
Repair roadway						
Install and compact 6" crushed stone base ma	403	SY	\$9.75	\$3,926	022-308-0100	98 Site p. 53
Install 3" binder course	403	SY	\$5.30	\$2,134	025-104-0160	98 Site p.67
Install 3" wearing course	403	SY	\$6.20	\$2,497	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	268	CY	\$0.47	\$126	022-226-5020	96 Site&Work
		Total			\$8,683	
Install retention pond						
Clear and grub/strip land	185	CY	\$0.61	\$113	021-144-0200	97 Site p. 34
Excavate soil	1,481	CY	\$1.00	\$1,481	022-4000	97 Bldg p. 51
Grade soil/shape basin	300	SY	\$0.72	\$216	025-122-1020	97 Site p. 63
Haul in base material/drainage rock	50	CY	\$12.65	\$633	A12.1-618-1200	97 Site p. 353
Install base material/drainage rock	50	CY	\$1.40	\$70	022-262-0010	97 Site p. 46
Install grass bottom	5	MSF	\$321.56	\$1,608	A12.7-411-1000	97 Site p. 393
		Total			\$4,121	
SUBTOTAL				\$363,725		
City cost index		93.7%				
TOTAL				\$340,810		
TOTAL with contingency of:		10%		\$374,891		
TOTAL with contingency of:		30%		\$443,053		
ROUNDED TO				\$375,000		
ROUNDED TO				\$443,000		

Table C.72. TO1 - Install new storm sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	1,993	LF	\$13.80	\$27,506	A12.3-110-1440	98 Heavy p.330
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
Install 30" concrete pipe	0	LF	\$55.50	\$0	027-162-2050	97 Site p. 92
Install pipe bedding	0	LF	\$5.35	\$0	A12.3-310-1660	98 Heavy p.333
Install 36" concrete pipe	0	LF	\$77.00	\$0	027-162-2060	98 Heavy p.99
Install pipe bedding	0	LF	\$9.61	\$0	A12.3-310-1700	98 Heavy p.333
Install 42" concrete pipe	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p.99
Install pipe bedding	0	LF	\$12.00	\$0	est	98 Heavy p.333
Install 48" concrete pipe	0	LF	\$105.00	\$0	027-162-2080	98 Heavy p.99
Install pipe bedding	0	LF	\$12.49	\$0	A12.3-310-1720	98 Heavy p.333
Install 60" concrete pipe(requires 54")	1,812	LF	\$138.00	\$250,056	027-162-2090	98 Heavy p.99
Install pipe bedding	1,812	LF	\$15.57	\$28,213	A12.3-310-1740	98 Heavy p.333
Install 72" concrete pipe	0	LF	\$184.00	\$0	027-162-22100	98 Heavy p.99
Install pipe bedding	0	LF	\$22.50	\$0	A12.3-310-1760	98 Heavy p.333
	Total			\$305,775		
<i>Install catch basins</i>						
Install catch basins	18	EA	\$1,535.00	\$27,630	A12.3-710-5820	97 Site p. 365
	Total			\$27,630		
<i>Install manholes</i>						
Install manholes	4	EA	\$1,495.00	\$5,980	A12.3-710-5820	98 Site p. 377
	Total			\$5,980		
<i>Remove existing pavement</i>						
Saw cut pavement	1,820	LF	\$3.89	\$7,080	020-728-0020	98 Fac p.48
Rubbish handling	134	CY	\$14.40	\$1,933	020-620-3080	98 Site p. 29
Haul debris to dump	134	CY	\$12.80	\$1,718	020-620-5000	98 Site p. 29
Disposal fee for debris	134	CY	\$6.00	\$805	CERL estimate	
	Total			\$11,536		
<i>Repair roadway</i>						
Install and compact 6" crushed stone base ma	403	SY	\$9.75	\$3,926	022-308-0100	98 Site p. 53
Install 3" binder course	403	SY	\$5.30	\$2,134	025-104-0160	98 Site p.67
Install 3" wearing course	403	SY	\$6.20	\$2,497	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	268	CY	\$0.47	\$126	022-226-5020	96 Site&Work
	Total			\$8,683		
SUBTOTAL				\$359,604		
City cost index						
TOTAL				\$336,949		
TOTAL with contingency of:				\$370,644		
TOTAL with contingency of:				\$438,033		
ROUNDED TO				\$371,000		
ROUNDED TO				\$438,000		

Table C.73. TO2 - Install new storm sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	663	LF	\$13.80	\$9,154	A12.3-110-1440	98 Heavy p.330
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
Install 30" concrete pipe	0	LF	\$55.50	\$0	027-162-2050	97 Site p. 92
Install pipe bedding	0	LF	\$5.35	\$0	A12.3-310-1660	98 Heavy p.333
Install 36" concrete pipe	0	LF	\$77.00	\$0	027-162-2060	98 Heavy p.99
Install pipe bedding	0	LF	\$9.61	\$0	A12.3-310-1700	98 Heavy p.333
Install 42" concrete pipe	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p.99
Install pipe bedding	0	LF	\$12.00	\$0	est	98 Heavy p.333
Install 48" concrete pipe	0	LF	\$105.00	\$0	027-162-2080	98 Heavy p.99
Install pipe bedding	0	LF	\$12.49	\$0	A12.3-310-1720	98 Heavy p.333
Install 60" concrete pipe	603	LF	\$138.00	\$83,214	027-162-2090	98 Heavy p.99
Install pipe bedding	603	LF	\$15.57	\$9,389	A12.3-310-1740	98 Heavy p.333
Install 72" concrete pipe	0	LF	\$184.00	\$0	027-162-22100	98 Heavy p.99
Install pipe bedding	0	LF	\$22.50	\$0	A12.3-310-1760	98 Heavy p.333
	Total			\$101,756		
<i>Install catch basins</i>						
Install catch basins	12	EA	\$1,535.00	\$18,420	A12.3-710-5820	97 Site p. 365
	Total			\$18,420		
<i>Install headwalls</i>						
Install headwalls	1	EA	\$4,050.00	\$4,050	A12.3-750-2100	98 Heavy p. 337
	Total			\$4,050		
SUBTOTAL						
City cost index	93.7%			\$124,226		
TOTAL				\$116,400		
TOTAL with contingency of:	10%			\$128,040		
TOTAL with contingency of:	30%			\$151,320		
ROUNDED TO				<u>\$128,000</u>		
ROUNDED TO				<u>\$151,000</u>		

Table C.74. TO3 - Install new storm sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	395	LF	\$13.80	\$5,450	A12.3-110-1440	98 Heavy p.330
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
Install 30" concrete pipe	0	LF	\$55.50	\$0	027-162-2050	97 Site p. 92
Install pipe bedding	0	LF	\$5.35	\$0	A12.3-310-1660	98 Heavy p.333
Install 36" concrete pipe	359	LF	\$77.00	\$27,643	027-162-2060	98 Heavy p.99
Install pipe bedding	359	LF	\$9.61	\$3,450	A12.3-310-1700	98 Heavy p.333
Install 42" concrete pipe	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p.99
Install pipe bedding	0	LF	\$12.00	\$0	est	98 Heavy p.333
Install 48" concrete pipe	0	LF	\$105.00	\$0	027-162-2080	98 Heavy p.99
Install pipe bedding	0	LF	\$12.49	\$0	A12.3-310-1720	98 Heavy p.333
Install 60" concrete pipe	0	LF	\$138.00	\$0	027-162-2090	98 Heavy p.99
Install pipe bedding	0	LF	\$15.57	\$0	A12.3-310-1740	98 Heavy p.333
Install 72" concrete pipe	0	LF	\$184.00	\$0	027-162-22100	98 Heavy p.99
Install pipe bedding	0	LF	\$22.50	\$0	A12.3-310-1760	98 Heavy p.333
					\$36,543	
<i>Install catch basins</i>						
Install catch basins	7	EA	\$1,535.00	\$10,745	A12.3-710-5820	97 Site p. 365
					\$10,745	
<i>Install headwalls</i>						
Install headwalls	1	EA	\$2,185.00	\$2,185	A12.3-750-2060	98 Heavy p. 337
					\$2,185	
SUBTOTAL				\$49,473		
City cost index						
TOTAL	93.7%			\$46,356		
TOTAL with contingency of:	10%			\$50,991		
TOTAL with contingency of:	30%			\$60,263		
<u>ROUNDED TO</u>				<u>\$51,000</u>		
<u>ROUNDED TO</u>				<u>\$60,000</u>		

Table C.75. TO4 - Install new storm sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	370	LF	\$13.80	\$5,100	A12.3-110-1440	98 Heavy p.330
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
Install 30" concrete pipe	0	LF	\$55.50	\$0	027-162-2050	97 Site p. 92
Install pipe bedding	0	LF	\$5.35	\$0	A12.3-310-1660	98 Heavy p.333
Install 36" concrete pipe	0	LF	\$77.00	\$0	027-162-2060	98 Heavy p.99
Install pipe bedding	0	LF	\$9.61	\$0	A12.3-310-1700	98 Heavy p.333
Install 42" concrete pipe	0	LF	\$88.50	\$0	027-162-2070	98 Heavy p.99
Install pipe bedding	0	LF	\$12.00	\$0	est	98 Heavy p.333
Install 48" concrete pipe	0	LF	\$105.00	\$0	027-162-2080	98 Heavy p.99
Install pipe bedding	0	LF	\$12.49	\$0	A12.3-310-1720	98 Heavy p.333
Install 60" concrete pipe	0	LF	\$138.00	\$0	027-162-2090	98 Heavy p.99
Install pipe bedding	0	LF	\$15.57	\$0	A12.3-310-1740	98 Heavy p.333
Install 78" concrete pipe	336	LF	\$245.00	\$82,320	027-162-2100/2120	98 Heavy p.99
Install pipe bedding	336	LF	\$26.13	\$8,780	A12.3-310-1760/17	98 Heavy p.333
	Total			\$96,200		
<i>Install catch basins</i>						
Install catch basins	7	EA	\$1,535.00	\$10,745	A12.3-710-5820	97 Site p. 365
	Total			\$10,745		
<i>Install headwalls</i>						
Install headwalls	1	EA	\$5,875.00	\$5,875	A12.3-750-2120/21	98 Heavy p. 337
	Total			\$5,875		
SUBTOTAL				\$112,820		
City cost index				\$105,712		
TOTAL						
TOTAL with contingency of:				\$116,284		
TOTAL with contingency of:				\$137,426		
ROUNDED TO				\$116,000		
ROUNDED TO				\$137,000		

Table C.76. SS-1 - Install new sanitary sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	2,299	LF	\$13.80	\$31,726	A12.3-110-1440	98 Heavy p.330
install 8" diameter concrete pipe	2,299	LF	\$12.50	\$28,738	027-162-1020	98 Plum p.44
Install pipe bedding	2,299	LF	\$1.93	\$4,437	A12.3-310-1460	98 Plum p. 405
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
		Total			\$64,901	
<i>Install manholes</i>						
Install manholes	4	EA	\$1,495.00	\$5,980	A12.3-710-5820	98 Site p. 377
SUBTOTAL		Total			\$5,980	
City cost index				\$70,881		
TOTAL		93.7%			\$66,415	
TOTAL with contingency of:		10%			\$73,057	
TOTAL with contingency of:		30%			\$86,340	
ROUNDED TO					<u>\$73,000</u>	
ROUNDED TO					<u>\$86,000</u>	

Table C.77. SS-1 - Install new sanitary sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	0	LF	\$13.80	\$0	A12.3-110-1440	98 Heavy p.330
install 8" diameter concrete pipe	2,299	LF	\$12.50	\$28,738	027-162-1020	98 Plum p.44
Install pipe bedding	2,299	LF	\$1.93	\$4,437	A12.3-310-1460	98 Plum p. 405
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$3	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$1	A12.3-310-1640	98 Heavy p.333
						\$33,180
<i>Install manholes</i>						
Install manholes	4	EA	\$1,495.00	\$5,980	A12.3-710-5820	98 Site p. 377
						\$5,980
SUBTOTAL				\$39,163		
City cost index				\$36,696		
TOTAL				\$40,365		
TOTAL with contingency of:		10%		\$47,704		
ROUNDED TO				\$40,000		
ROUNDED TO				\$48,000		

Table C.78. SS-2 - Install new sanitary sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	549	LF	\$13.80	\$7,575	A12.3-110-1440	98 Heavy p.330
install 8" diameter concrete pipe	0.00	LF	\$12.50	\$0	027-162-1020	98 Plum p.44
Install pipe bedding	0	LF	\$1.93	\$0	A12.3-310-1460	98 Plum p. 405
Install 12" concrete pipe	549	LF	\$15.70	\$8,618	027-162-2010	97 Site p. 92
Install pipe bedding	549	LF	\$2.03	\$1,114	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
		Total				\$17,307
<i>Install manholes</i>						
Install manholes	1	EA	\$1,495.00	\$1,495	A12.3-710-5820	98 Site p. 377
SUBTOTAL				\$1,495		
City cost index				\$18,802		
TOTAL				\$17,617		
TOTAL with contingency of:				\$19,379		
TOTAL with contingency of:				\$22,902		
ROUNDED TO				<u>\$19,000</u>		
ROUNDED TO				<u>\$23,000</u>		

Table C.79. SS-3 - Install new sanitary sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	1,359	LF	\$13.80	\$18,747	A12.3-110-1440	98 Heavy p.330
install 8" diameter concrete pipe	0.00	LF	\$12.50	\$0	027-162-1020	98 Plum p.44
Install pipe bedding	0	LF	\$1.93	\$0	A12.3-310-1460	98 Plum p. 405
Install 12" concrete pipe	1,027	LF	\$15.70	\$16,130	027-162-2010	97 Site p. 92
Install pipe bedding	1,027	LF	\$2.03	\$2,086	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	331	LF	\$16.70	\$5,529	027-162-2020	97 Site p. 92
Install pipe bedding	331	LF	\$3.38	\$1,119	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
						\$43,612
<i>Install manholes</i>						
Install manholes	2	EA	\$1,495.00	\$2,990	A12.3-710-5820	98 Site p. 377
						\$2,990
SUBTOTAL						\$46,602
City cost index						\$43,666
TOTAL						
TOTAL with contingency of:						\$48,032
TOTAL with contingency of:						\$56,765
<u>ROUNDED TO</u>						<u>\$48,000</u>
<u>ROUNDED TO</u>						<u>\$57,000</u>

Table C.80. SS-4 - Install new sanitary sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	702	LF	\$13.80	\$9,685	A12.3-110-1440	98 Heavy p.330
install 8" diameter concrete pipe	701.80	LF	\$12.50	\$8,773	027-162-1020	98 Plum p.44
Install pipe bedding	702	LF	\$1.93	\$1,354	A12.3-310-1460	98 Plum p. 405
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
	Total				\$19,812	
<i>Install manholes</i>						
Install manholes	1	EA	\$1,495.00	\$1,495	A12.3-710-5820	98 Site p. 377
SUBTOTAL				\$21,307	\$1,495	
City cost index	93.7%					
TOTAL				\$19,964		
TOTAL with contingency of:	10%			\$21,961		
TOTAL with contingency of:	30%			\$25,954		
ROUNDED TO				<u>\$22,000</u>		
ROUNDED TO				<u>\$26,000</u>		

Table C.81. SS-7 - Install new sanitary sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install pipe						
Excavate/backfill trench	1,021	LF	\$13.80	\$14,087	A12.3-110-1440	98 Heavy p.330
install 8" diameter concrete pipe	0.00	LF	\$12.50	\$0	027-162-1020	98 Plum p.44
Install pipe bedding	0	LF	\$1.93	\$0	A12.3-310-1460	98 Plum p. 405
Install 12" concrete pipe	1,021	LF	\$15.70	\$16,027	027-162-2010	97 Site p. 92
Install pipe bedding	1,021	LF	\$2.03	\$2,072	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
	Total			\$32,186		
Install manholes						
Install manholes	2	EA	\$1,495.00	\$2,990	A12.3-710-5820	98 Site p. 377
	Total			\$2,990		
Remove existing pavement						
Saw cut pavement	2,058	LF	\$3.89	\$8,004	020-728-0020	98 Fac p.48
Rubbish handling	151	CY	\$14.40	\$2,178	020-620-3080	98 Site p. 29
Haul debris to dump	151	CY	\$12.80	\$1,936	020-620-5000	98 Site p. 29
Disposal fee for debris	151	CY	\$6.00	\$907	CERL estimate	
	Total			\$13,025		
Repair roadway						
Install and compact 6" crushed stone bas	454	SY	\$9.75	\$4,423	022-308-0100	98 Site p. 53
Install 3" binder course	454	SY	\$5.30	\$2,405	025-104-0160	98 Site p.67
Install 3" wearing course	454	SY	\$6.20	\$2,813	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	302	CY	\$0.47	\$142	022-226-5020	96 Site&Work
	Total			\$9,783		
SUBTOTAL				\$57,984		
City cost index	93.7%					
TOTAL				\$54,331		
TOTAL with contingency of:	10%			\$59,764		
TOTAL with contingency of:	30%			\$70,630		
ROUNDED TO				\$60,000		
ROUNDED TO				\$71,000		

Table C.82. SS-8 - Install new sanitary sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	1,263	LF	\$13.80	\$17,427	A12.3-110-1440	98 Heavy p.330
install 8" diameter concrete pipe	0.00	LF	\$12.50	\$0	027-162-1020	98 Plum p.44
Install pipe bedding	0	LF	\$1.93	\$0	A12.3-310-1460	98 Plum p. 405
Install 12" concrete pipe	1,263	LF	\$15.70	\$19,826	027-162-2010	97 Site p. 92
Install pipe bedding	1,263	LF	\$2.03	\$2,563	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
		Total		\$39,816		
<i>Install manholes</i>						
Install manholes	2	EA	\$1,495.00	\$2,990	A12.3-710-5820	98 Site p. 377
		Total		\$2,990		
<i>Remove existing pavement</i>						
Saw cut pavement	2,542	LF	\$3.89	\$9,887	020-728-0020	98 Fac p.48
Rubbish handling	187	CY	\$14.40	\$2,694	020-620-3080	98 Site p. 29
Haul debris to dump	187	CY	\$12.80	\$2,395	020-620-5000	98 Site p. 29
Disposal fee for debris	187	CY	\$6.00	\$1,122	CERL estimate	
		Total		\$16,098		
<i>Repair roadway</i>						
Install and compact 6" crushed stone base material	561	SY	\$9.75	\$5,472	022-308-0100	98 Site p. 53
Install 3" binder course	561	SY	\$5.30	\$2,975	025-104-0160	98 Site p.67
Install 3" wearing course	561	SY	\$6.20	\$3,480	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	374	CY	\$0.47	\$176	022-226-5020	96 Site&Work
		Total		\$12,102		
SUBTOTAL				\$71,006		
City cost index						
TOTAL		93.7%		\$66,533		
TOTAL with contingency of:				\$73,186		
TOTAL with contingency of:				\$86,493		
<u>ROUNDED TO</u>				<u>\$73,000</u>		
<u>ROUNDED TO</u>				<u>\$86,000</u>		

Table C.83. SS-9 - Install new sanitary sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	497	LF	\$13.80	\$6,861	A12.3-110-1440	98 Heavy p.330
install 8" diameter concrete pipe	0.00	LF	\$12.50	\$0	027-162-1020	98 Plum p.44
Install pipe bedding	0	LF	\$1.93	\$0	A12.3-310-1460	98 Plum p. 405
Install 12" concrete pipe	497	LF	\$15.70	\$7,806	027-162-2010	97 Site p. 92
Install pipe bedding	497	LF	\$2.03	\$1,009	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
	Total			\$15,677		
<i>Install manholes</i>						
Install manholes	1	EA	\$1,495.00	\$1,495	A12.3-710-5820	98 Site p. 377
	Total			\$1,495		
SUBTOTAL				\$17,172		
City cost index						
TOTAL				\$16,090		
TOTAL with contingency of:				\$17,699		
TOTAL with contingency of:				\$20,917		
<u>ROUNDED TO</u>				<u>\$18,000</u>		
<u>ROUNDED TO</u>				<u>\$21,000</u>		

Table C.84. SS-10 - Install new sanitary sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	1,254	LF	\$13.80	\$17,305	A12.3-110-1440	98 Heavy p.330
install 8" diameter concrete pipe	1,254.00	LF	\$12.50	\$15,675	027-162-1020	98 Plum p.44
Install pipe bedding	1,254	LF	\$1.93	\$2,420	A12.3-310-1460	98 Plum p. 405
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
	Total			\$35,400		
<i>Install manholes</i>						
Install manholes	2	EA	\$1,495.00	\$2,990	A12.3-710-5820	98 Site p. 377
	Total			\$2,990		
SUBTOTAL				\$38,390		
City cost index						
TOTAL				\$35,972		
TOTAL with contingency of:				\$39,569		
TOTAL with contingency of:				\$46,763		
<u>ROUNDED TO</u>				<u>\$40,000</u>		
<u>ROUNDED TO</u>				<u>\$47,000</u>		

Table C.85. SS-10 - Install new sanitary sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	1,606	LF	\$13.80	\$22,163	A12.3-110-1440	98 Heavy p.330
install 8" diameter concrete pipe	1,606	LF	\$12.50	\$20,075	027-162-1020	98 Plum p.44
Install pipe bedding	1,606	LF	\$1.93	\$3,100	A12.3-310-1460	98 Plum p. 405
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
	Total			\$45,337		
<i>Install manholes</i>						
Install manholes	3	EA	\$1,495.00	\$4,485	A12.3-710-5820	98 Site p. 377
	Total			\$4,485		
SUBTOTAL				\$49,822		
City cost index						
TOTAL				\$46,684		
TOTAL with contingency of:	10%			\$51,352		
TOTAL with contingency of:	30%			\$60,689		
<u>ROUNDED TO</u>				<u>\$51,000</u>		
<u>ROUNDED TO</u>				<u>\$61,000</u>		

Table C.86. SS-13 - Install new sanitary sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	586	LF	\$13.80	\$8,091	A12.3-110-1440	98 Heavy p.330
install 8" diameter concrete pipe	586	LF	\$12.50	\$7,329	027-162-1020	98 Plum p.44
Install pipe bedding	586	LF	\$1.93	\$1,132	A12.3-310-1460	98 Plum p. 405
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
		Total				\$16,551
<i>Install manholes</i>						
Install manholes	1	EA	\$1,495.00	\$1,495	A12.3-710-5820	98 Site p. 377
		Total				\$1,495
<i>Remove existing pavement</i>						
Saw cut pavement	1,189	LF	\$3.89	\$4,624	020-728-0020	98 Fac p.48
Rubbish handling	87	CY	\$14.40	\$1,251	020-620-3080	98 Site p. 29
Haul debris to dump	87	CY	\$12.80	\$1,112	020-620-5000	98 Site p. 29
Disposal fee for debris	87	CY	\$6.00	\$521	CERL estimate	
		Total				\$7,507
<i>Repair roadway</i>						
Install and compact 6" crushed stone base	261	SY	\$9.75	\$2,541	022-308-0100	98 Site p. 53
Install 3" binder course	261	SY	\$5.30	\$1,381	025-104-0160	98 Site p.67
Install 3" wearing course	261	SY	\$6.20	\$1,616	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	174	CY	\$0.47	\$82	022-226-5020	96 Site&Work
		Total				\$5,619
SUBTOTAL				\$31,173		
City cost index		93.7%				
TOTAL				\$29,209		
TOTAL with contingency of:		10%		\$32,130		
TOTAL with contingency of:		30%		\$37,971		
<u>ROUNDED TO</u>				<u>\$32,000</u>		
<u>ROUNDED TO</u>				<u>\$38,000</u>		

Table C.87. SS-14 - Install new sanitary sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	1,008	LF	\$13.80	\$13,905	A12.3-110-1440	98 Heavy p.330
install 8" diameter concrete pipe	677	LF	\$12.50	\$8,456	027-162-1020	98 Plum p.44
Install pipe bedding	677	LF	\$1.93	\$1,306	A12.3-310-1460	98 Plum p. 405
Install 12" concrete pipe	331	LF	\$15.70	\$5,198	027-162-2010	97 Site p. 92
Install pipe bedding	331	LF	\$2.03	\$672	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
		Total				\$29,537
<i>Install manholes</i>						
Install manholes	2	EA	\$1,495.00	\$2,990	A12.3-710-5820	98 Site p. 377
		Total				\$2,990
<i>Remove existing pavement</i>						
Saw cut pavement	2,031	LF	\$3.89	\$7,901	020-728-0020	98 Fac p.48
Rubbish handling	149	CY	\$14.40	\$2,150	020-620-3080	98 Site p. 29
Haul debris to dump	149	CY	\$12.80	\$1,911	020-620-5000	98 Site p. 29
Disposal fee for debris	149	CY	\$6.00	\$896	CERL estimate	
		Total				\$12,857
<i>Repair roadway</i>						
Install and compact 6" crushed stone base material	448	SY	\$9.75	\$4,366	022-308-0100	98 Site p. 53
Install 3" binder course	448	SY	\$5.30	\$2,373	025-104-0160	98 Site p.67
Install 3" wearing course	448	SY	\$6.20	\$2,776	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	299	CY	\$0.47	\$140	022-226-5020	96 Site&Work
		Total				\$9,657
SUBTOTAL						\$55,041
City cost index						\$51,573
TOTAL						
TOTAL with contingency of:		10%		\$56,731		
TOTAL with contingency of:		30%		\$67,045		
ROUNDED TO				\$57,000		
ROUNDED TO				\$67,000		

Table C.88. SS-15 - Install new sanitary sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
Install pipe						
Excavate/backfill trench	1,416	LF	\$13.80	\$19,537	A12.3-110-1440	98 Heavy p.330
install 8" diameter concrete pipe	447	LF	\$12.50	\$5,583	027-162-1020	98 Plum p.44
Install pipe bedding	447	LF	\$1.93	\$862	A12.3-310-1460	98 Plum p. 405
Install 12" concrete pipe	969	LF	\$15.70	\$15,215	027-162-2010	97 Site p. 92
Install pipe bedding	969	LF	\$2.03	\$1,967	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
	Total			\$43,163		
Install manholes						
Install manholes	3	EA	\$1,495.00	\$4,485	A12.3-710-5820	98 Site p. 377
	Total			\$4,485		
Remove existing pavement						
Saw cut pavement	2,847	LF	\$3.89	\$11,076	020-728-0020	98 Fac p.48
Rubbish handling	210	CY	\$14.40	\$3,020	020-620-3080	98 Site p. 29
Haul debris to dump	210	CY	\$12.80	\$2,685	020-620-5000	98 Site p. 29
Disposal fee for debris	210	CY	\$6.00	\$1,258	CERL estimate	
	Total			\$18,040		
Repair roadway						
Install and compact 6" crushed stone base material	629	SY	\$9.75	\$6,135	022-308-0100	98 Site p. 53
Install 3" binder course	629	SY	\$5.30	\$3,335	025-104-0160	98 Site p.67
Install 3" wearing course	629	SY	\$6.20	\$3,901	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	419	CY	\$0.47	\$197	022-226-5020	96 Site&Work
	Total			\$13,568		
SUBTOTAL				\$79,255		
City cost index						
TOTAL	93.7%			\$74,262		
TOTAL with contingency of:				\$81,689		
TOTAL with contingency of:				\$96,541		
ROUNDED TO				<u>\$82,000</u>		
ROUNDED TO				<u>\$97,000</u>		

Table C.89. SS-16 - Install new sanitary sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	689	LF	\$13.80	\$9,503	A12.3-110-1440	98 Heavy p.330
install 8" diameter concrete pipe	0	LF	\$12.50	\$0	027-162-1020	98 Plum p.44
Install pipe bedding	0	LF	\$1.93	\$0	A12.3-310-1460	98 Plum p. 405
Install 12" concrete pipe	689	LF	\$15.70	\$10,811	027-162-2010	97 Site p. 92
Install pipe bedding	689	LF	\$2.03	\$1,398	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
				\$21,712		
<i>Install manholes</i>						
Install manholes	1	EA	\$1,495.00	\$1,495	A12.3-710-5820	98 Site p. 377
				\$1,495		
<i>Remove existing pavement</i>						
Saw cut pavement	1,393	LF	\$3.89	\$5,420	020-728-0020	98 Fac p.48
Rubbish handling	102	CY	\$14.40	\$1,469	020-620-3080	98 Site p. 29
Haul debris to dump	102	CY	\$12.80	\$1,306	020-620-5000	98 Site p. 29
Disposal fee for debris	102	CY	\$6.00	\$612	CERL estimate	
				\$8,806		
<i>Repair roadway</i>						
Install and compact 6" crushed stone base material	306	SY	\$9.75	\$2,984	022-308-0100	98 Site p. 53
Install 3" binder course	306	SY	\$5.30	\$1,622	025-104-0160	98 Site p.67
Install 3" wearing course	306	SY	\$6.20	\$1,897	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	204	CY	\$0.47	\$96	022-226-5020	96 Site&Work
				\$6,599		
SUBTOTAL				\$38,612		
City cost index	93.7%					
TOTAL				\$36,180		
TOTAL with contingency of:	10%			\$39,798		
TOTAL with contingency of:	30%			\$47,034		
<u>ROUNDED TO</u>				<u>\$40,000</u>		
<u>ROUNDED TO</u>				<u>\$47,000</u>		

Table C.90. SS-18 - Install new sanitary sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	1,990	LF	\$13.80	\$27,461	A12.3-110-1440	98 Heavy p.330
install 8" diameter concrete pipe	0	LF	\$12.50	\$0	027-162-1020	98 Plum p.44
Install pipe bedding	0	LF	\$1.93	\$0	A12.3-310-1460	98 Plum p. 405
Install 12" concrete pipe	1,990	LF	\$15.70	\$31,241	027-162-2010	97 Site p. 92
Install pipe bedding	1,990	LF	\$2.03	\$4,039	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	0	LF	\$19.80	\$0	027-162-2030	97 Site p. 92
Install pipe bedding	0	LF	\$3.50	\$0	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
		Total				\$62,742
<i>Install manholes</i>						
Install manholes	4	EA	\$1,495.00	\$5,980	A12.3-710-5820	98 Site p. 377
		Total				\$5,980
<i>Remove existing pavement</i>						
Saw cut pavement	1,998	LF	\$3.89	\$7,772	020-728-0020	98 Fac p.48
Rubbish handling	147	CY	\$14.40	\$2,123	020-620-3080	98 Site p. 29
Haul debris to dump	147	CY	\$12.80	\$1,887	020-620-5000	98 Site p. 29
Disposal fee for debris	147	CY	\$6.00	\$884	CERL estimate	
		Total				\$12,666
<i>Repair roadway</i>						
Install and compact 6" crushed stone base material	442	SY	\$9.75	\$4,311	022-308-0100	98 Site p. 53
Install 3" binder course	442	SY	\$5.30	\$2,344	025-104-0160	98 Site p.67
Install 3" wearing course	442	SY	\$6.20	\$2,742	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	295	CY	\$0.47	\$139	022-226-5020	96 Site&Work
		Total				\$9,535
SUBTOTAL				\$90,922		
City cost index						
TOTAL				\$85,194		
TOTAL with contingency of:		10%		\$93,714		
TOTAL with contingency of:		30%		\$110,753		
ROUNDED TO				\$94,000		
ROUNDED TO				\$111,000		

Table C.91. SA4 - Install new sanitary sewer lines.

Action	Quantity	UOM	Cost/unit	Total Cost	Means Ref. No.	Book
<i>Install pipe</i>						
Excavate/backfill trench	1,733	LF	\$13.80	\$23,909	A12.3-110-1440	98 Heavy p.330
install 8" diameter concrete pipe	0	LF	\$12.50	\$0	027-162-1020	98 Plum p.44
Install pipe bedding	0	LF	\$1.93	\$0	A12.3-310-1460	98 Plum p. 405
Install 12" concrete pipe	0	LF	\$15.70	\$0	027-162-2010	97 Site p. 92
Install pipe bedding	0	LF	\$2.03	\$0	A12.3-310-1500	98 Heavy p.333
Install 15" concrete pipe	0	LF	\$16.70	\$0	027-162-2020	97 Site p. 92
Install pipe bedding	0	LF	\$3.38	\$0	A12.3-310-1540	98 Heavy p.333
Install 18" concrete pipe	1,733	LF	\$19.80	\$34,304	027-162-2030	97 Site p. 92
Install pipe bedding	1,733	LF	\$3.50	\$6,064	A12.3-310-1580	98 Heavy p.333
Install 24" concrete pipe	0	LF	\$29.00	\$0	027-162-2040	97 Site p. 92
Install pipe bedding	0	LF	\$5.23	\$0	A12.3-310-1640	98 Heavy p.333
						\$64,276
<i>Install manholes</i>						
Install manholes	3	EA	\$1,495.00	\$4,485	A12.3-710-5820	98 Site p. 377
						\$4,485
<i>Remove existing pavement</i>						
Saw cut pavement	2,785	LF	\$3.89	\$10,833	020-728-0020	98 Fac p.48
Rubbish handling	205	CY	\$14.40	\$2,957	020-620-3080	98 Site p. 29
Haul debris to dump	205	CY	\$12.80	\$2,628	020-620-5000	98 Site p. 29
Disposal fee for debris	205	CY	\$6.00	\$1,232	CERL estimate	
						\$17,650
<i>Repair roadway</i>						
Install and compact 6" crushed stone base material	616	SY	\$9.75	\$6,006	022-308-0100	98 Site p. 53
Install 3" binder course	616	SY	\$5.30	\$3,265	025-104-0160	98 Site p.67
Install 3" wearing course	616	SY	\$6.20	\$3,819	025-104-0460	98 Site p.68
Compaction of 6" asphalt surface	411	CY	\$0.47	\$193	022-226-5020	96 Site&Work
						\$13,283
SUBTOTAL				\$99,694		
City cost index						
TOTAL	93.7%			\$93,413		
TOTAL with contingency of:				\$102,754		
TOTAL with contingency of:				\$121,437		
<u>ROUNDED TO</u>				<u>\$103,000</u>		
<u>ROUNDED TO</u>				<u>\$121,000</u>		

Table C.92. Sample of demolition cost estimate by building type.

FAMILY HOUSING -12 units (DORMITORY)		Revised Costs 12/19/95				
Commercial Type:						
Gross SF:	25,000					
Height FT:	36					
Exterior:	Wood					
Structure:	Wood					
COMPONENT LIST						
System/Component	Amount	Units	Unit Cost	Total Demo	MEANS REFERENCE NUMBER(S)	
Roof						
Built-Up Roofing	8,340.0	Sq. Ft.	\$1.51	\$12,593.40	020-726-3001	97 Fac
Wood Decking	8,340.0	Sq. Ft.	\$1.33	\$11,092.20	020-728-5020	97 Fac
Wood Joists	1,200.0	Linear Ft.	\$60	\$720.00	020-714-4280	97 Fac
Structure (Building Framework)						
Wood Columns	1,944.0	Linear Ft.	\$2.19	\$4,257.36	020-714-5500	97 Fac
Wood Beams	2,310.0	Linear Ft.	\$12.20	\$28,182.00	020-714-3160	97 Fac
Exterior Finish						
Wood Siding on Wood Framing	3,300.0	Sq. Ft.	\$2.26	\$7,458.00	00 & 020-726-5220	97 Fac
Exterior Closure						
Steel (Painted) Metal Exterior Door	8.0	Each	\$16.45	\$131.60	020-706-0200	97 Fac
Aluminum Frame Full Glazed Exterior Door	2.0	Each	\$16.45	\$32.90	020-706-0200	97 Fac
Aluminum Operable Window (12sf) 1st Floor	90.0	Each	\$18.80	\$1,692.00	020-734-0200	97 Fac
Aluminum Operable Window (12sf) 2nd Floor	90.0	Each	\$18.80	\$1,692.00	020-734-0200	97 Fac
Aluminum Operable Window (12sf) 3rd Floor	90.0	Each	\$18.80	\$1,692.00	020-734-0200	97 Fac
Walls & Doors						
Hollow Core (Painted) Interior Door	111.0	Each	\$13.15	\$1,459.65	020-706-0500	97 Fac
Solid Core (Painted) Interior Door	84.0	Each	\$54.65	\$4,590.60	00 & 020-706-2000	97 Fac
Sheetrock (Unstippled) Wall Fin	63,270.0	Sq. Ft.	\$26	\$16,450.20	020-732-1000	97 Fac
Floors						
Ceramic Tile Flooring	2,000.0	Sq. Ft.	\$83	\$1,660.00	020-712-2000	97 Fac
Concrete, Finished Flooring	1,250.0	Sq. Ft.	\$3.22	\$4,025.00	020-754-0280	97 Fac
Carpet, Nylon20oz., low traffic	21,750.0	Sq. Ft.	\$06	\$1,305.00	020-712-0480	97 Fac
Ceilings						
Sheetrock (Unstippled) Ceiling	25,000.0	Sq. Ft.	\$73	\$18,250.00	020-702-0240	97 Fac
Plumbing						
Service Sink, Iron Enamel	3.0	Each	\$46.50	\$139.50	020-724-1300	97 Fac
Shower, Ceramic Tile	12.0	Each	\$61.50	\$738.00	020-724-1120	97 Fac
Drinking Fountain, vit. china	3.0	Each	\$46.50	\$139.50	020-724-1600	97 Fac
Tankless Water Closet	12.0	Each	\$46.50	\$558.00	020-724-1400	97 Fac
Lavatory, Vitreous China	24.0	Each	\$37.00	\$888.00	020-724-1200	97 Fac
Pipe and Fittings, waste/vent, c.i. 6"	0.6	Linear Kft.	\$7.40	\$4,440.00	020-724-2100	97 Fac
Pipe and Fittings, waste/vent, c.i. 10"	0.2	Linear Kft.	\$12.35	\$2,470.00	020-724-2150	97 Fac
Pipe & Fittings, cold water Copper 2"	2.0	Linear Kft.	\$1.85	\$3,700.00	020-724-2000	97 Fac
Pipe & Fittings, cold water Copper 3/4"	1.6	Linear Kft.	\$1.85	\$2,960.00	020-724-2000	97 Fac
Insulation, pipe	3.3	Linear Kft.	\$3.37	\$11,121.00	155-651-6840	97 Fac
Water htr, gas/oil 175 Gph	12.0	Each	\$61.50	\$738.00	020-724-2250	97 Fac
Pipe & Fittings, hot water Copper 3/4"	1.0	Linear Kft.	\$1.85	\$1,850.00	020-724-2000	97 Fac
Circulator Pump, 1/12 hp	2.0	Each	\$50.00	\$100.00	Estimated	
4" drain, roof scupper, area	2.0	Each	\$50.00	\$100.00	Estimated	
Pipe & fit drainage PVC 4"	0.2	Linear Kft.	\$2.47	\$494.00	020-724-2050	97 Fac
Fire protect, sprinkler head	125.0	Each	\$10.00	\$1,250.00	Estimated	
HVAC						
Furnace	12.0	Each	\$164.00	\$1,968.00	020-718-2300	97 Fac
pipe fittings, steel, 4"	0.9	Linear Kft.	\$2.47	\$2,223.00	020-724-2050	97 Fac
air conditioner	12.0	Each	\$335.00	\$4,020.00	020-718-0100	97 Fac
Electrical						
Main switch, <=1200 amp	1.0	Each	\$325.00	\$325.00	020-708-1250	97 Fac
Distribution switch, fused, 0-600 V	3.0	Each	\$40.50	\$121.50	020-708-1120	97 Fac
Motor starter, 21-50 hp, <600 V	2.0	Each	\$740.00	\$1,480.00	020-718-3000	97 Fac
Motor starter, 5-20 hp, <600 V	3.0	Each	\$740.00	\$2,220.00	020-718-3000	97 Fac
Fluorescent Lighting Fixture	14.0	Each	\$26.50	\$371.00	020-708-2440	97 Fac
Safety						
Manual Pull station	6.0	Each		\$0.00		
smoke detector	15.0	Each		\$0.00		
fire alarm bell	2.0	Each		\$0.00		
fire alarm cont. panel	1.0	Each		\$0.00		
Hauling and Handling						
Handle load into truck	1,111.1		\$24.50	\$27,222.22		
Haul it to the dump	1,111.1		\$6.20	\$6,888.89		
Disposal fees	1,111.1		\$35.00	\$38,888.89		
TOTAL				\$234,698		
COST PER SQUARE FOOT				\$ 9.39		

Table C.93. Asbestos removal for building demolition.

ASBESTOS REMOVAL					MEANS REFERENCE NUMBER(S)
System/Component	Amount	Units	Unit Cost	Total Demo	
Abestos Removal					
Transite Roof	8,340.0	Sq. Ft.	4.04	\$33,693.60	020-840-3000 97 Fac
Encapsulate	8,340.0	Sq. Ft.	0.69	\$5,754.60	020-870-0110 97 Fac
TOTAL FOR ASBESTOS REMOVAL				\$39,448.20	
TOTAL COST PER SQ. FT. (ASBESTOS REMOVAL ONLY) =				\$4.73	
TOTAL COST PER SQ. FT. OF BUILDING AREA =				\$1.58	

ASBESTOS REMOVAL					MEANS REFERENCE NUMBER(S)
System/Component	Amount	Units	Unit Cost	Total Demo	
Abestos Removal					
VAT Floor	2,000.0	Sq. Ft.	1.35	\$2,700.00	020-840-5000 97 Fac
Encapsulate	2,000.0	Sq. Ft.	0.39	\$780.00	020-870-0100 97 Fac
TOTAL FOR ASBESTOS REMOVAL				\$3,480.00	
TOTAL COST PER SQ. FT. (ASBESTOS REMOVAL ONLY) =				\$1.74	
TOTAL COST PER SQ. FT. OF BUILDING AREA =				\$.14	

ASBESTOS REMOVAL					MEANS REFERENCE NUMBER(S)
System/Component	Amount	Units	Unit Cost	Total Demo	
Abestos Removal					
Pipe Insulation up to 4" diameter pipe	3,300.0	Linear Ft.	3.6	\$11,880.00	020-840-0600 97 Fac
Encapsulate	3,300.0	Linear Ft.	4.41	\$14,553.00	020-870-0300 97 Fac
TOTAL FOR ASBESTOS REMOVAL				\$26,433.00	
TOTAL COST PER SQ. FT. (ASBESTOS REMOVAL ONLY) =				\$8.01	
TOTAL COST PER SQ. FT. OF BUILDING AREA =				\$1.06	

ASBESTOS REMOVAL					MEANS REFERENCE NUMBER(S)
System/Component	Amount	Units	Unit Cost	Total Demo	
Abestos Removal					
Transite Wall Siding	9,900.0	Linear Ft.	4.04	\$39,996.00	020-840-3000 97 Fac
Encapsulate	9,900.0	Linear Ft.	0.39	\$3,861.00	020-870-0100 97 Fac
TOTAL FOR ASBESTOS REMOVAL				\$43,857.00	
TOTAL COST PER SQ. FT. (ASBESTOS REMOVAL ONLY) =				\$4.43	
TOTAL COST PER SQ. FT. OF BUILDING AREA =				\$1.75	

Table C.94. FRA estimates for property-wide research park improvements.

Infrastructure Item	Cost per Acre	Estimated Cost
Roads	\$16,400	\$2,175,000
Steam	\$4,000	\$531,000
Domestic Water	\$6,000	\$796,000
Sanitary Sewer	\$3,500	\$464,000
Storm Water	\$4,000	\$531,000
Totals	\$33,900	\$4,496,000

Table C.95. Comparison of contingency factors.

System	Basic Estimates w/o contingency & soft costs				Total Estimates w/contingency & soft cost			
	No. FRA Greater	Total No. Projects	FRA Total (\$M)	CERL Total	No. FRA Greater	FRA Total	CERL Range (\$M)	
Roads	10	21	8.8	8	14	12.8	9.8 - 11.6	
Water	4	16	1.2	1.4	8	1.8	1.5 - 1.8	
Sewer	10	14	0.8	0.7	11	1.1	0.8 - 0.9	
Storm	7	19	2.3	1.9	10	3.3	2.1 - 2.5	
Estimate Higher	44%				61%			

Distribution

Chief of Engineers 20314-1000

ATTN: CEHEC-IM-LH (2)

ATTN: CEHEC-IM-LP (2)

ATTN: CERD-L

ATTN: CERE-C (2)

ACSIM 20310-0600

ATTN: DAIM-BO (5)

U.S. Army Engineer District, Omaha

ATTN: CENWO-RE-M (2)

U.S. Army Medical Command (2)

Fort Sam Houston, TX 78234-6000

U.S. Army Garrison, Fitzsimons (2)

Defense Technical Info Center 22060-6218

ATTN: DTIC-O (2)

20

6/98